THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1922.] LONDON, MARCH 13, 1900. [52ND YEAR. PRICE 6d.

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Illuminating Power . . . 16·4 Candles.
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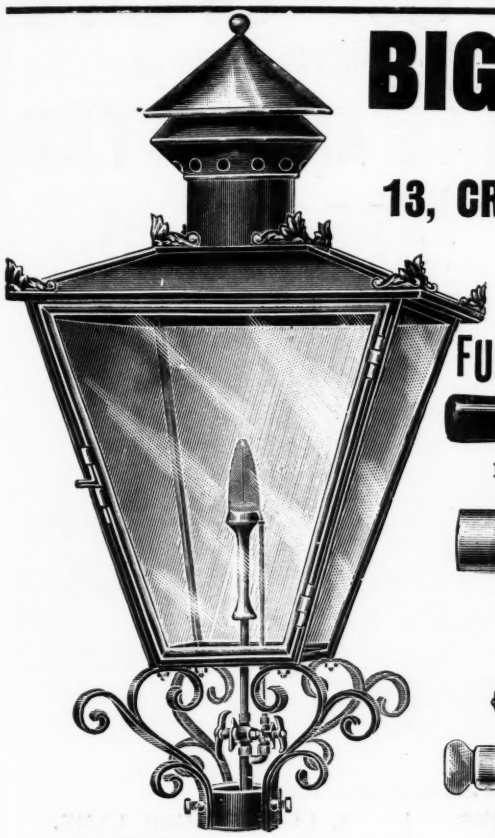

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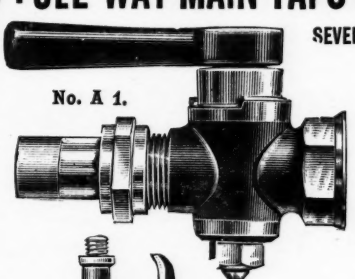
SEVERAL DESIGNS SHOWN BELOW.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THESE TAPS ARE
FULL-WAY
AS SHOWN.

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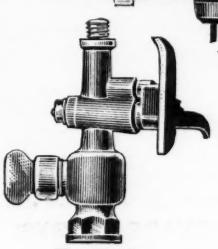
LANTERN TAPS.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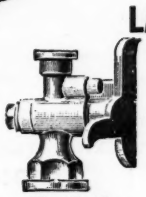
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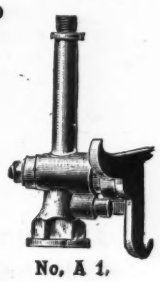
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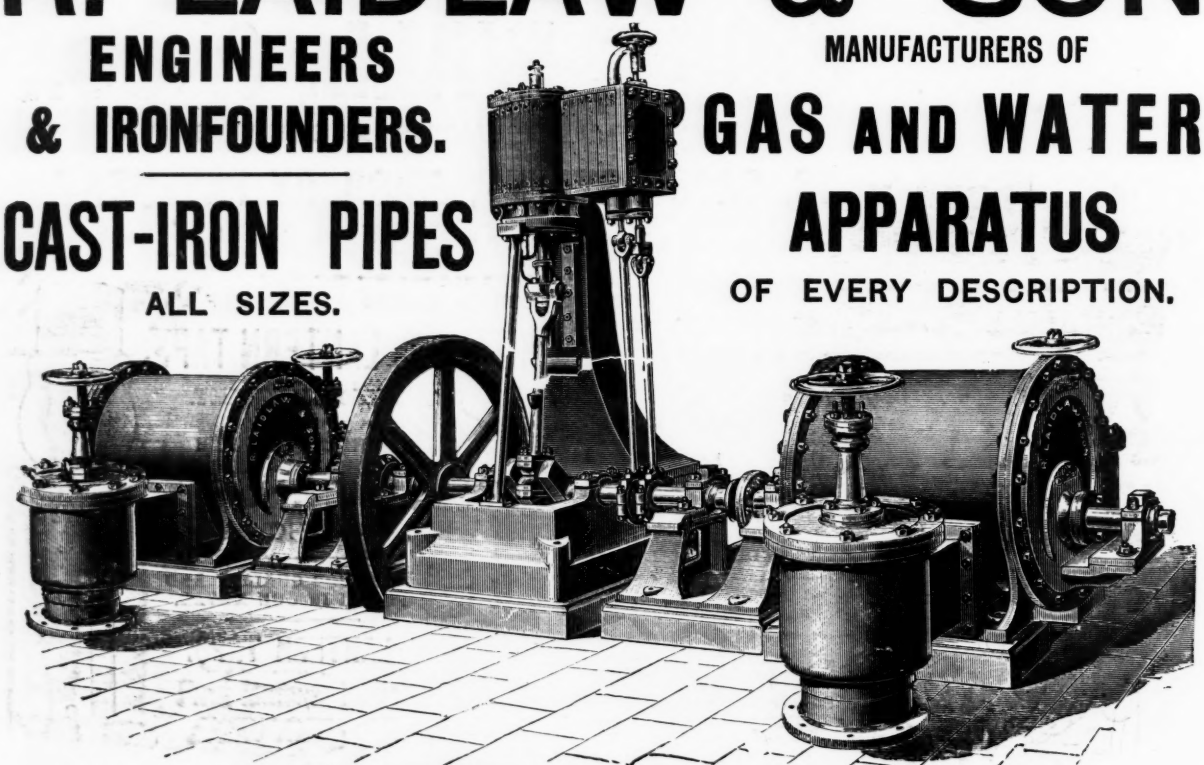

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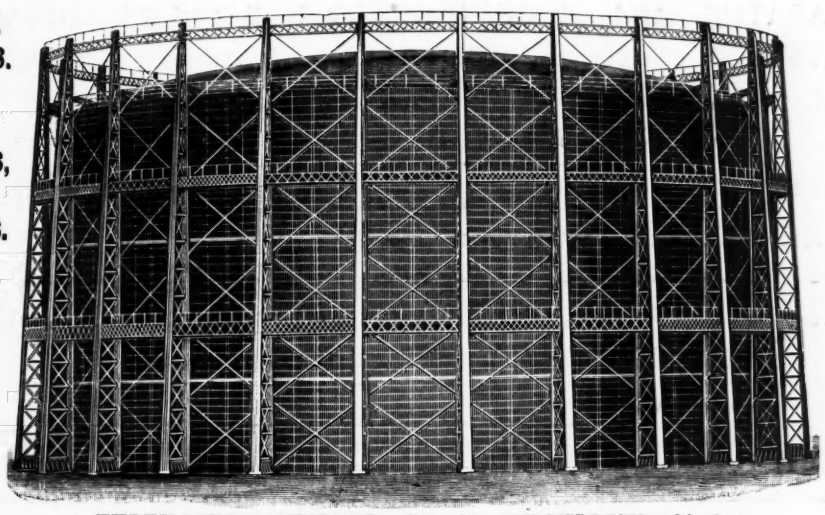

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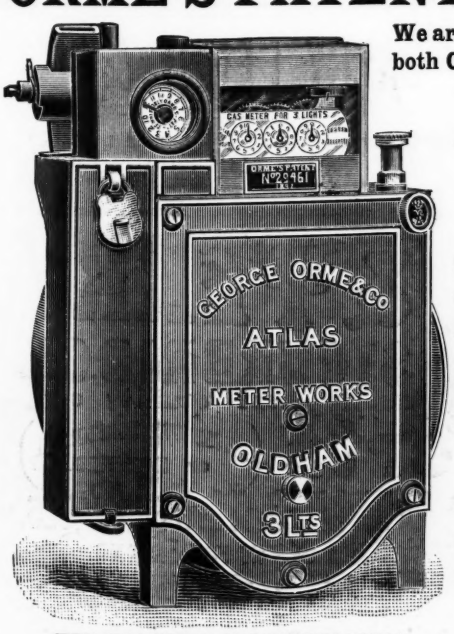

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A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

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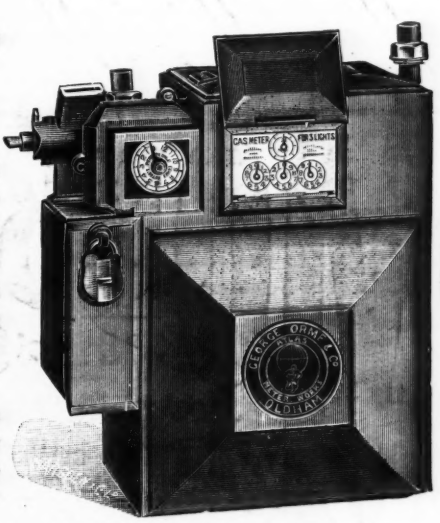
The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



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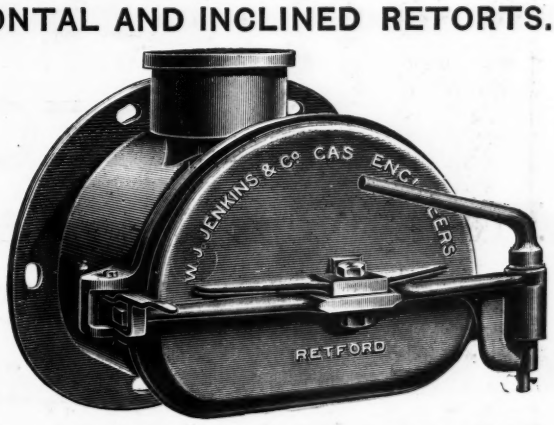

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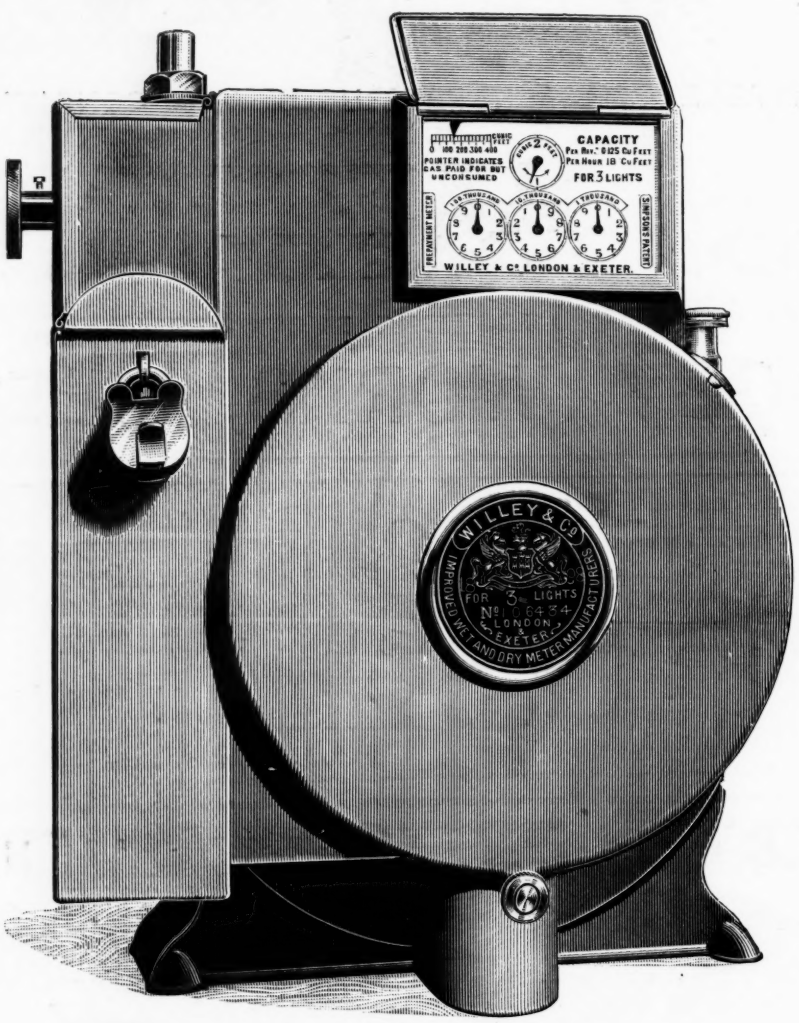

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"SIMPLEX" CHIMNEYLESS BURNER

Manufactured under the De Mare MASTER Patent and subsequent Minor Patents.

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With SUNLIGHT WHITE MANTLE.

The "Simplex" is fitted with a Removable Cap and an Air-Adjusting Ring, making it quite easy for anyone to adapt the Burner to the very varying Pressures and Qualities of Gas in different parts of the country.

The "Simplex" Burner is so constructed as to make the light practically shadowless; and this, coupled with the fact that it is of a much more artistic shape, gives it an enormous advantage over the very unsightly competing infringement for the moment on the market.

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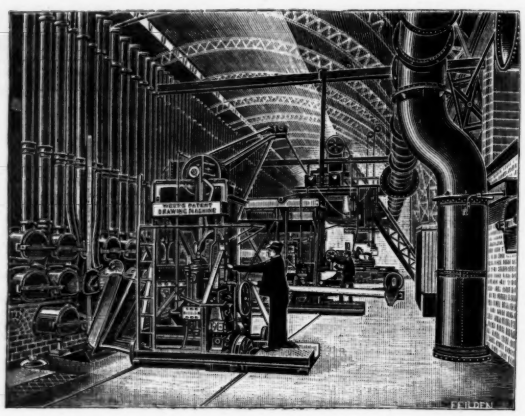
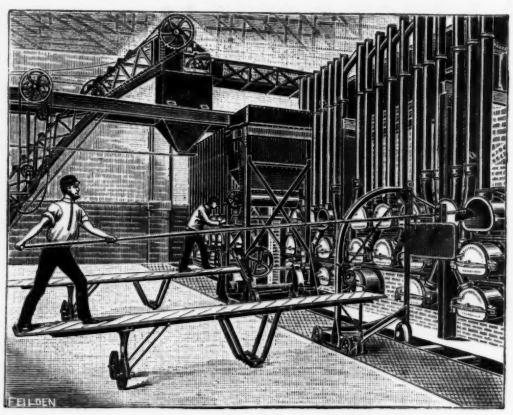


West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.



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Silent Coke-Conveyor.

SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

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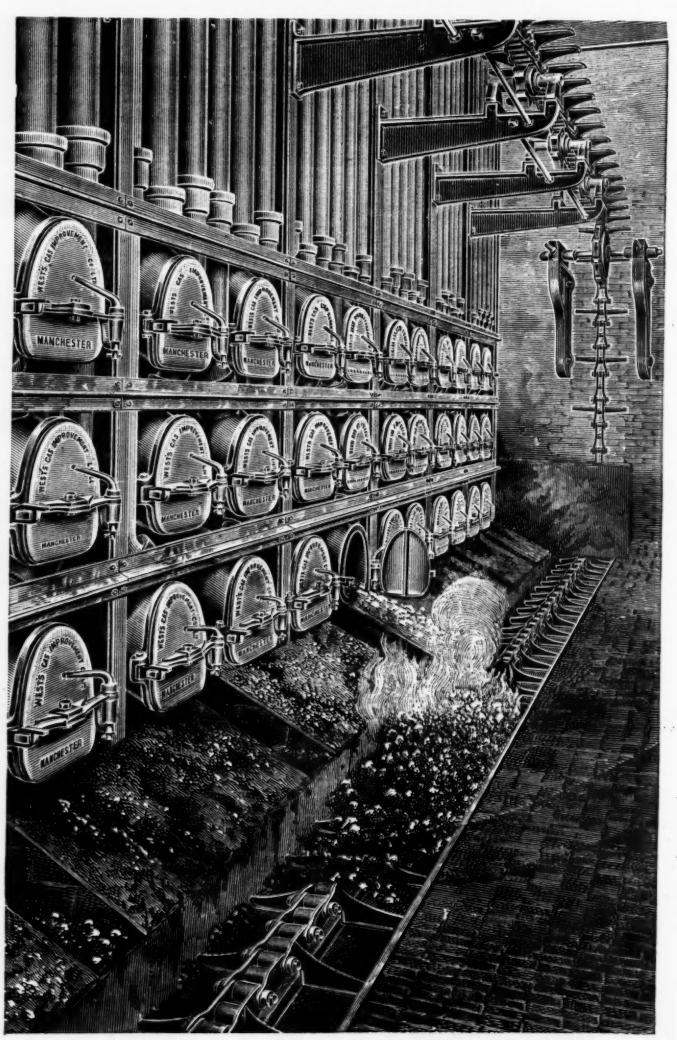
DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.



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West's Patent Regenerator Furnaces and Settings, Mouthpieces, Retort-Bench Fittings, &c. Air-Compressors, Hauling-Capstans, and General Engineering.

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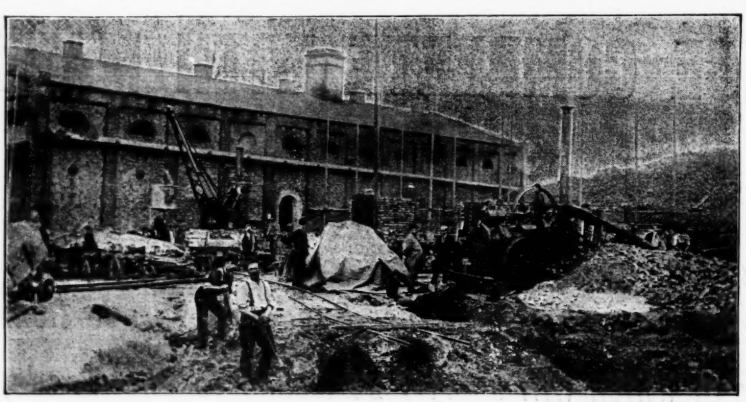

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INCLINED and FLOOR-LEVEL SETTINGS, with or without REGENERATIVE or GENERATOR FURNACES, with or without IRONWORK. COMPLETE RE-SETTING.

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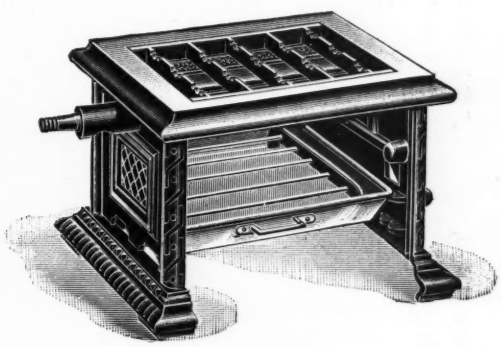

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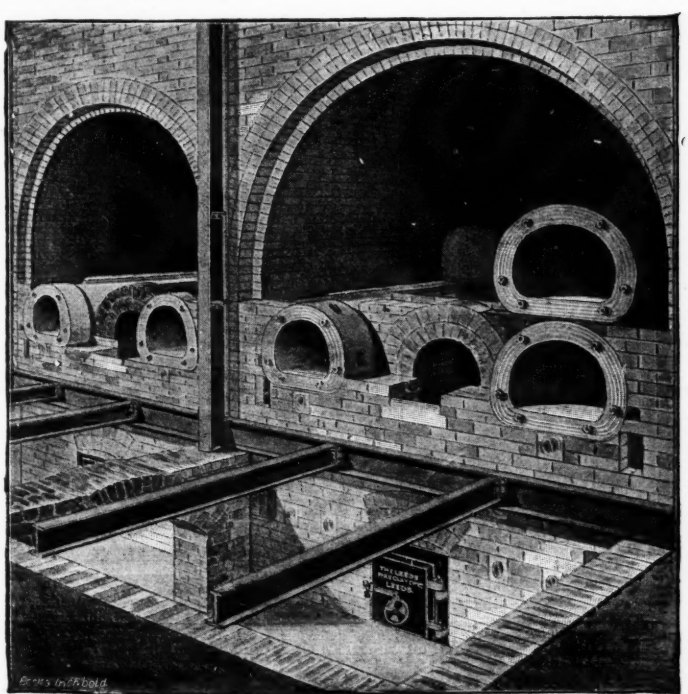

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INCLINED, HORIZONTAL,

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MANY INSTALLATIONS.

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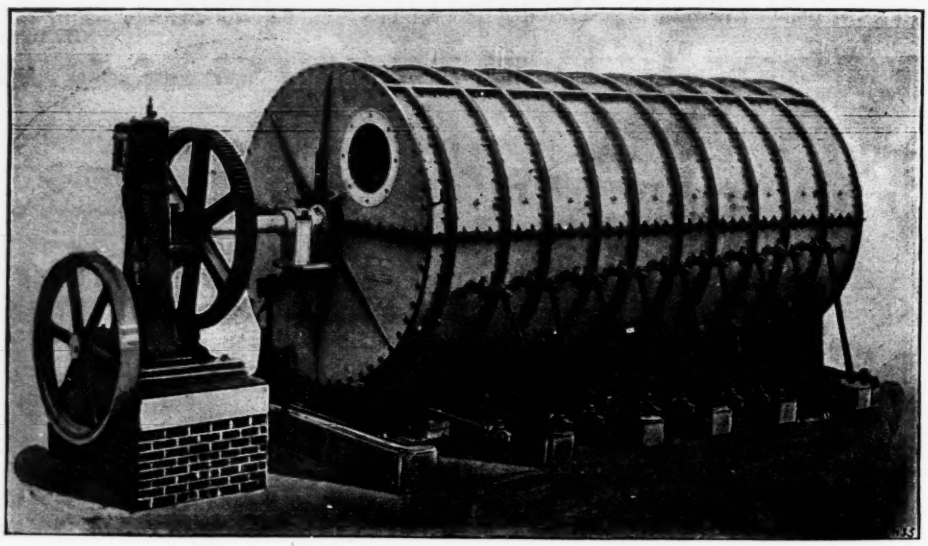
Complete Extraction of Ammonia and large proportion of CO_2 and H_2S.

Maximum Strength Liquor produced, Minimum Water Supply and Driving Power required.



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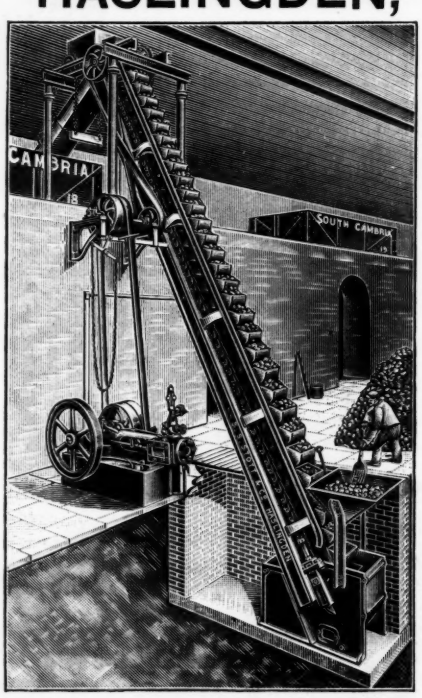

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HIGH-CLASS **STEAM-ENGINES** up to 1000-Horse Power.

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Copenhagen (Second)	2,500,000	Edinburgh	2,000,000	Utrecht	1,000,000
Belfast	1,700,000	Guildford	350,000	Deventer	150,000
Belfast (Second)	4,500,000	Brentford	1,200,000	Portsmouth	1,000,000
Brussels	700,000	Syracuse, N.Y.	850,000	Bournemouth	1,000,000
Brussels (Second)	700,000	Bridlington	125,000	Aylesbury	150,000
Liverpool	3,500,000	Middlesbrough	1,250,000	Hamburg	1,750,000
Liverpool (Second)	4,500,000	Croydon	1,250,000	Redhill	275,000
Tottenham	750,000	L. & N.W. Ry., Crewe	700,000	Dublin	2,000,000
Tottenham (Second)	750,000	Taunton	225,000	Posen	450,000
Santiago de Cuba	400,000	Lawrence, Mass.	400,000	Dunedin (N.Z.)	150,000
Swansea	750,000	Commercial Gas Co.	850,000	Lincoln	500,000
Manchester	3,000,000	Commercial (Second)	850,000	Antwerp	1,500,000
Brighton	1,750,000	Commercial (Third)	1,250,000	Brussels	1,000,000
Preston	1,500,000	Rotterdam	850,000	Brighton (Second)	1,850,000
New York	1,200,000	Dorking	125,000	Stockport (Second)	500,000
Southport	750,000	McKeesport, Pa.	500,000	Croydon (Second)	625,000
Bath	1,000,000	G.L.&C.Co., Bromley	3,750,000	Maidenhead (Second)	225,000
Newburg, N.Y.	350,000	G.L.&C.Co., Nine Elms	2,750,000	G.L.&C.Co., Beckton	2,250,000
Newburg (Second)	250,000	Durham	200,000	G.L.&C.Co., Fulham	1,750,000
Hoylake	125,000	New York	4,000,000	Tottenham (Third)	350,000
Coventry	600,000	Scarborough	800,000	Sydney (Harbour)	500,000
Coventry (Second)	600,000	Perth, W.A.	125,000	Sydney (Mortlake)	500,000
Bordentown, N.J.	125,000	Bremen	550,000	Manchester (Second)	3,500,000
Winchester	200,000	Maidenhead	225,000	Hull	1,500,000
Shanghai	225,000	Epsom	225,000	Longton	600,000
Stockport	500,000	North Middlesex	150,000	Staines	600,000
Norwich	1,000,000	Wandsworth	1,800,000	Commercial (Fourth)	2,000,000
Holyoke, Mass.	600,000	Aarhus	800,000	Dublin (Second)	2,000,000
St. Joseph, Mo.	750,000	Falmouth	150,000	Faversham	200,000
Lea Bridge	350,000	Southampton	800,000	Birmingham (Swan V'ge)	1,500,000
Lea Bridge (Second)	350,000				

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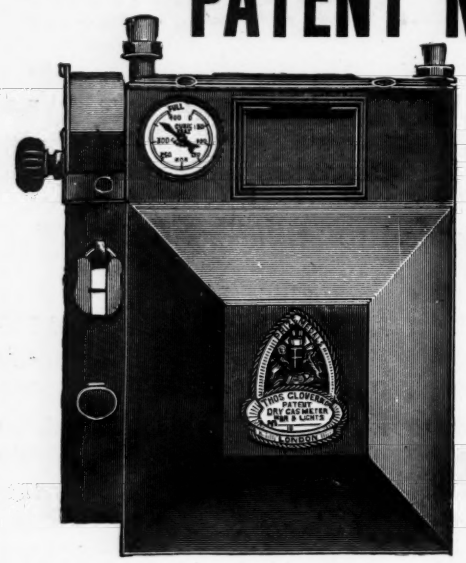

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EDITORIAL NOTES.

The Budget—An Injustice.

THE introduction of this year's Budget by the Chancellor of the Exchequer was signalized by a good deal of that kind of anticipatory movement described by Shakspeare as "alarums and excursions." Parliamentary tradition prescribes the giving of adequate notice of the introduction of the financial statement of the Administration of the day, in order that the Opposition may be prepared for an event which has sometimes determined the fate of a Government. Unfortunately, this candid practice has its drawbacks. The amenities of parliamentary conflict are dearly purchased at the cost of what it would perhaps be harsh to characterize as an illegitimate financial and business use of the usual notification. The circumstances count for everything in this connection. Our Imperial taxation is now based on so exceedingly narrow a foundation, that it is only too easy to forecast the direction in which a Chancellor of the Exchequer must proceed either to put taxes on or to take them off. Join to this knowledge the equally certain expectation of the financial necessities of the year which every educated citizen must possess, and it follows that men of business, and the Chancellor of the Exchequer, are obliged to play a more or less deep game whenever Budget day comes round. In ordinary times, the stakes played for are not large. When national income and expenditure are nearly balanced, Budgets are perforce uninteresting; the age of heroic experiments in taxation being past. This year, however, everybody knew that the Chancellor of the Exchequer would want very much more money than usual to pay for national defence, national justification, and national insurance. The "man in the street" had fully resigned himself to the conviction that a capital sum of one hundred millions sterling, or thereabouts, would have to be laid out on the British Empire. To do him justice, he thought that the investment was called for, and was prepared to find his proper share. But naturally, human nature being what it is, the Scriptural injunction to "bear one another's burdens" does not hold good in business. Income-tax payers, of course, knew they were in for it; they always are. The seat of political power has shifted since the memorable period when Mr. Gladstone promised to abolish this impost if he were returned to office. Income-tax payers may then have had the making and unmaking of parliamentary majorities; but this glory has departed from them. For many years the middle classes, the heaviest payers of income-tax, have paid into the revenue more than the share corresponding to their political power. This year, therefore, the income-tax was bound to go up, whatever else was done to raise the wind so heavily drawn upon in shouting "Rule Britannia." But there was also the indirect taxation to be thought of. An increase all round was recognized as inevitable. The only question for the general public was, "How much?" while for the alert and highly astute gentlemen trading in excisable articles the more pressing question was added, "When?"

What happened is history. Short as the notice of the Budget night was, the owners of excisable goods in bond trod one another under foot in their desperate endeavour to clear their property at the old duties. This temporary excitement over, the country finds itself laid under another fourpence in the pound income-tax, which consequently stands at one-twentieth of all dutiable annual values, profits, and emoluments. Well and good. The charge is not so much as our forefathers had to pay on occasions of emergency; and of course it will be paid now. But what of the other sources of revenue already alluded to? and what of the whole bearing of the national taxation? We venture to hold that it is high time the consciences of our statesmen were pricked by the reminder that they are one and all, irrespective of Party, following the dangerous practice of separating political power from liability to taxation. The new Budget is a particularly bad example of this evil. It makes a great parade of financial virtue, whereas it is really sunk in the depths of political profligacy. We say nothing about the much-debated questions of the proportions in which the cost of the war should be divided as between the Transvaal and the United Kingdom, or as between capital and revenue. There is something in the financial propositions of the Government of far deeper import than these passing problems. It is the principle—

implicit, though not avowed—that as much as possible of the indirect taxation raised by the Excise should be levied on the same classes of people as already pay income-tax; while the mass of the population shall be spared any additional impost. That this is the fact, a glance at the increased duties on excisable commodities clearly shows. Who will have to pay the shilling per barrel extra on beer, and the similarly heightened duty on spirits, tobacco, and other articles? Who but the purchasers of these goods in quantities sufficiently large to allow of an aliquot part of the higher duty being charged in the bill? Income-tax payers, to a man. The purchaser of beer by the pint, or of tobacco by the ounce, will not suffer. The merchant pays for him—another income-tax payer!

Of course, we do not deny that, in principle, indirect taxation is bad, and also admit that where it is prevalent the poorest of the community suffer most. The "Daily News" puts it that "to indirect taxation a man contributes in the "inverse ratio of his means." This is true; but the sting of the truth is taken out when the indirect taxation is levied almost exclusively upon articles which men can mostly go without. Besides, there is a fine art in adjusting wholesale costs to retail prices, which we suspect the advisers of the Chancellor of the Exchequer know, or imagine they know, something about. The value of the units of currency chiefly employed in small marketing transactions, the corresponding subdivision of weights and measures, are among the things that determine when and how far variations of wholesale costs, including taxation, shall come down to the retail purchaser. Raise a shopkeeper's rent by any amount, he cannot charge more over the counter for his wares. Increase the expenses of commerce in some ways, and up go retail prices directly—and at times with advantages to the dealer. Not to labour the point, we contend that it is well within this margin, in which the merchant pays the difference of duty, that the exercises of our Chancellors of the Exchequer in search of additional revenue are conducted. The dumb income-tax payer pays for all, or very nearly all, that the Government profess to put upon other men's shoulders. This may be prudent politics, but it cannot be sound statesmanship.

London Gas Bills in Parliament.

The House of Commons have committed the Bills of the Gaslight and Coke Company and South Metropolitan Gas Company, subject to modifications of the "Instructions" mentioned last week as awaiting the judgment of the House. Almost for a wonder, these instructions were not ruled out of order; but when they were moved, Sir James Rankin, who was Chairman of the Powers of Charge Committee, brought forward as an amendment words which converted the mandatory direction to the Committee into an optional matter. This was quite right and proper, if only because the House has never had an opportunity of hearing the Companies interested, or of expressing its judgment on the Committee's recommendations. As the instructions stood, they were tantamount to acceptance of some of the recommendations picked out from the others. The President of the Board of Trade approved of Sir James's suggestion, and remarked that he thought the two Bills would go before the same Committee. The case of the Gaslight and Coke Company's Bill was distinctly more difficult for the House to leave open than that of the South Metropolitan, for a particular reason stated in the short debate. However, in the event, all went satisfactorily. There is every prospect of the Bills getting into Committee by an early date, as the House is ploughing through its Private Bill business at a brisk rate. The constitution of the Committee on the London Companies' Bills will be a serious consideration, to which we may be sure that ample attention will be given by the authorities. There is no reason to expect, however, that the proceedings of the Committee when the Bills come before them will be protracted by the hearing of many witnesses. Very little expert testimony will be needed to put the Committee in possession of the merits of the Bills; and Counsel will probably abstain from superfluous rhetoric.

The "Policy" of the London County Council.

It was imperative that the Water Committee of the London County Council should without delay set about preparing a rejoinder to the strong report of the Royal Commission on the Water Supply of the Metropolis. The particular subject-matter of this statement, which was adopted by the County Council as a thing of course, is dealt with in another part of the "Journal;" but the general character of the spirit and manner in which the work of the Royal Commission is received by the County Council is worth noticing here. Having assumed the part of prosecutors of the Water Companies from the first moment of their corporate existence, the County Council continue in the same way; and their rejoinder—it is not to be called an answer—to the Commissioners' report is strictly analogous to the closing speech of Counsel for the prosecution before the issue is put to the Jury. Thus, the registered pious opinion, which was fully formed and expressed years before the County Council came into being, that the water supply of London ought on theoretical grounds to be in the hands of a public authority, is coolly appropriated by the County Council as "its policy of purchase and public ownership." The formal acceptance of this opinion by the Royal Commission, not as proved, but as something they could put behind them, is also taken possession of in the same sense. With regard to the practical questions of how the expropriation of the Companies might be effected, what kind of public authority should take over the undertakings and be responsible for the supply present and future, and what might be expected to follow upon the transfer financially and otherwise, the report of the Royal Commission, it will be remembered, was dead against the pretensions of the London County Council. Upon the whole of this part of the case, the County Council can, therefore, only say that they still retain their old opinion. Of course; but, happily for the population of London, the final decision in the matter does not rest with the present majority of the Council. The Council want to buy up the Companies, on special terms to be prescribed by a Special Act of Parliament. They set at naught the objections of other involved Authorities, as honourable as they, to the realization of this desire, with the lofty remark that "we cannot help "thinking that when once purchase is effected, the future "arrangement for the Metropolitan Water Supply would "not be difficult of settlement as between the various "Authorities." Cannot one hear Mr. Littler, the Chairman of the Middlesex County Council, and a man of considerable experience in these matters, murmuring thanks on behalf of the county to the authors of these generous sentiments? It is a fact, as true as it is painful, that not a single public Authority or private Corporation concerned in the question has a good word to say for that part of the water policy of the London County Council which is its very own.

An aspect of the general question with which we are specially concerned is the way in which the London County Council have endeavoured to impose their views upon the public Press. There are some newspapers conducted by men who keep a level head in regard to municipal politics; but others, who ought to know better, are making a sad mess of their task of helping to form public opinion upon the subject. Take the following, for a specimen of ineptitude dashed with prejudice: "The majority of the Council "demand the same right to provide and control the supply "of water as every other municipal body in the United "Kingdom possesses." This is about as correct a definition of the issue as the celebrated French description of a crab as "a red fish which walks backwards;" to which it was objected that it was only wrong in that a crab is not red, is not a fish, and does not walk backwards. So here, the London County Council is not a Municipality; and only those Municipal Corporations who have obtained special and particular statutory powers for the purpose enjoy the "right" to provide and control the water supply of their districts. It is grotesquely untrue to say that every municipal body possesses this "right." Moreover, the claim of the London County Council in this respect is characterized as being "modest." Modesty, like morality, is perhaps a question of latitude. What is perfectly certain is that, if the London County Council were a Municipal Corporation with exclusive powers of local government over a district approximately coterminous with the water-supply area, and if they were content to approach the problem of municipalizing the existing undertakings in the same way as Municipal Corporations and Local Authorities throughout the country have had to do it, Parliament would be able to determine the question of the expediency of transfer on its merits.

This, however, is precisely what the London County Council cannot and will not do in the circumstances. The fate that now attends their actual proposals in this regard

is of enormous moment for the owners of all properties of similar character to the London water undertakings. They want to ride roughshod over all opposition from public authorities as good as themselves. They want the Legislature to accommodate them with special terms of purchase, such as no other Local Authority with similar desires has ever enjoyed. Meanwhile, before negotiations for the purchase have been originated, they want statutory permission to attack the Water Companies in the rear by bringing in an independent supply which none but their own paid officers affects to consider necessary or expedient. And all this is a "modest" programme! The County Council should approach the London School Board, and get a new dictionary put into circulation for the use of young Progressives.

A Lesson from Darlington.

A BEAUTIFUL illustration of the advantages of Municipalism as applied to gas supply was reported in the "JOURNAL" last week from Darlington. It is always taken for granted, whenever the comparison is made between the public and private ownership and control of such a business as that of gas supply, that the quality of the administration is the same in each instance. This assumption, of course, underlies the whole case for municipalizing such undertakings. Now, it is not necessary to argue that Gas Companies are always well administered, and Municipal Gas Departments never, in order to show that, all things being equal, the probability is that the average Gas Director will understand his business better than the average Gas Committeeman. If this only means that the former knows how to take advice better than the latter, this is no small recommendation. The truth is that the Director has a sense of undivided interest and responsibility, which the "scratch" Town Councilman lacks. This is the true lesson of the Darlington example. Here, three years ago, the necessity of enlarging the gasholder room became urgent; but the Town Council did not see it. Three years have passed; and the urgency has become feverish. The additional accommodation is to be provided; but meanwhile prices have risen, and the delay will cost the town a fine of from £6000 to £10,000. Still, the amateur gas administrator of Darlington babbles of the growth of the electric light, and other matters. How did he get elected on the Town Council? Certainly not for his ability to carry on business in a businesslike way. Is every shoedealer to shut up shop because another man "opens" over the way? So long as trade increases, does it matter one jot how many try to profit thereby? Truly, the marvel grows, whence do they get these Town Councillors? A man who has it in him to manage an apple-stall might be a more eligible Gas Committeeman than nine out of ten of the self-styled "practical men" who undertake the duty. Gas administration, like most other industrial affairs, requires soberness of judgment and a power of appreciating evidence. A Gas Director knows that he is responsible for providing all things needful for keeping up the service. When he is told what the rule for the proportion of gas storage to daily output is, he has common sense enough to know that the rule must be correct. Not so, apparently, some Gas Committeemen. There may be too many of them, or their tenure of power is too short, or something—the fact still remains that at Darlington they have been trying to rub along with half the normal amount of gasholder room, with the inevitable results of dear working. Now it is dear gasholders as well.

The Legal Discouragement of Strikes.

THE unrecognized, but most powerful, of the practical resources of militant Trade Unionism are now one by one coming under the repressive power of the law of the land. It was noticed in these columns some time ago that the Associated Trade Unions had abandoned their idea of appealing against the legal decision which made picketing unlawful, by putting it upon the same footing as besetting. This intelligence has lately been circulated officially by the Employers' Parliamentary Council. In view of this, what all the Federations of Trade Unions of which one hears occasionally are good for, if it is not for trying fundamental issues such as that to the last extremity, it would be really hard to say. Picketing in force has always been regarded, justly, as part of the tactics of a strike in action. Without it, there must be the greatest possible difficulty in differentiating a strike, from a desertion in mass. Strikers will henceforward have to rely upon the moral strength of their cause to gain their end. A strike ought consequently to be called in future by some other name. Last week the long-pending question of the legal right of strikers to go upon the poor-rates for relief was also decided in the negative. It will be remembered that the question arose out of the South Wales colliers' strike in 1898, when the men sought to make amends for having omitted to provide themselves with a strike fund, by going on the rates. It has been delicately said in this connection that the Guardians found themselves confronted with a problem of considerable difficulty. But inasmuch as they might conceivably have been elected from the same order as the strikers, whereas the largest ratepayers were the very colliery owners against whom the men were striking, the difficulty may have been theoretical only. At any rate, the Guardians relieved the strikers; and the ratepayers brought them to book. Lord Justice Romer, who heard the case first, held that Guardians need only satisfy themselves of the fact of destitution in dispensing poor-law relief. The Appeal Court have now decided differently. They allow the right to relief of the families of strikers, and also of outside workmen prevented from earning their living by a strike not of their making. Strikers, however, who can have work for the asking are not entitled to be supported in idleness at the expense of the ratepayers. The judgment will perhaps be a little difficult to work in practice; but it is a salutary pronouncement bearing the impress of common sense. It now remains to be seen what the Local Government Board will do concerning the surcharging of the £25,000 that was illegally spent in this way by the Guardians of the Merthyr Tydvil Union. It is a serious amount in any case; but in the circumstances a crushing liability.

WATER AND SANITARY AFFAIRS.

THE meeting of the London County Council last Tuesday was made specially interesting by the presentation by the Water Committee of their views on the report of the Royal Commission on the Metropolitan Water Supply. The Committee devoted four weeks to the study of that document; and the result is embodied in the report which they laid before the Council, and of which an abstract appears in another column. The Committee, as is not surprising, agree and disagree with the Commissioners. When the Council came into existence eleven years ago, they immediately proceeded to press forward their policy of "purchase and public ownership of the Metropolitan Water Supply;" and the Committee claim that in the expression by the Commissioners of the opinion that it is desirable that the undertakings of the Water Companies should be acquired and managed by a public authority, they affirm the main principles for which the Council have contended, and use the very arguments which have been employed in support of their policy during the progress of the controversy. But when the Council talked of "public ownership," they, of course, meant possession and management by themselves; whereas when the Commissioners speak of a "public authority," they have in their minds a specially constituted body. This is the point on which there is difference of opinion. However, the Committee recognize in the Commissioners' recommendation as to purchase a distinct appreciation of its advantages. The question then arises as to the terms upon which it is to take place. The Committee submit that the London Water Companies have been established by Parliament on the basis of competition, and are still liable to it. This fact, which the Commissioners admitted, they consider differentiates their position from that of the water undertakings in the Provinces which possess an absolute monopoly, and justifies the Council's claim that they should be brought specially under the notice of the arbitrator. The liability to competition may possibly still exist; but surely it is very remote. The Companies, if not monopolists, are in possession of privileges which have been conferred by Parliament; and these will have to be taken into account when the worth of their undertakings comes to be appraised. The fair value of these, the Committee frankly acknowledge, will have to be ascertained by a court of arbitration of the highest standing, and armed with the fullest authority to inquire into all the circumstances of each individual case. In other words, the arbitrator must have a perfectly free hand.

The Committee naturally object to the proposed Water

Board. The Council thought they ought to be the Water Authority for London; and the Commission held a different opinion, on the ground of the Council being pledged to sever the undertakings and carry out their Welsh scheme. The Committee think that if the Board were created, one of their earliest acts would be to bring about a "dissolu-"tion of partnership," if the outside Local Authorities were bent on severance. Moreover, as several of them are anxious that no more water should be drawn from their areas, which the Committee say are "already depleted," they consider it not inconceivable that the new Board would arrive at the conclusions come to by the Council in regard to resorting to Wales. We think they would be far more likely to utilize to the utmost the sources of supply lying close at hand. But when the purchase of the undertakings has been effected, the Committee think a settlement with the various authorities will be easy; and they suggest that the Council might be authorized to supply them in bulk, as proposed in the Bill now before Parliament. There is something in this idea, assuming that the authorities are willing to be dependent upon the Council for their water supply. We are inclined to think they would prefer taking it from a body upon which they were directly represented. This matter of representation on the proposed Board is another point on which the Committee and the Commission are at variance. It must be acknowledged that the Council's representation to the extent of 33 per cent. of the total number of members is lower than that contained in previous proposals; Lord James, in 1896, giving them nearly twice this proportion—18 out of 30. The Committee think the Council would, on the ordinary basis of population or rateable value, be justified in claiming at least 21 out of 28 seats allotted to various representative bodies; and the Commissioners' proposal of 10 appears to them to be one which can never be fairly imposed upon London. Their suggestion would, of course, give London a permanent majority. This, however, is, to a certain extent, a detail which could be dealt with later on. The first thing to be done towards settling the Metropolitan Water Question is, as the Committee remark, to obtain some decision by Parliament upon the method and principle of purchase, quite apart from the question of management; and they think this could be done in the present session. We agree with them that, in the public interest —and, it may be added, in that of the Water Companies also—this matter should be settled at once. The report closes with some remarks on the future supply of water to the Metropolis and the comparative cost of the Welsh and Thames supplies. These are dealt with elsewhere.

The presentation of the report did not give rise to a very angry debate, though it was prolonged; a spirit of conciliation seeming to pervade the Council. Mr. Dickinson, the Chairman of the Water Committee, warned the Conservative members that they had taken upon themselves a very grave responsibility in deciding to ask for the rejection of the Council's Bills. The Council must, he said, either go forward with their purchase policy or they must drop it; and to enable them to do the former, he would not say that they would not be justified in accepting something less than they had asked for. He charged the Commission with looking on the matter of the price to be paid for the water undertakings from the worst point of view, as far as the public were concerned; and he was sanguine enough to believe that, when the settlement came, they would find they had made a better bargain than that which the Commissioners had forecast. He, of course, upheld the carrying out of the Welsh scheme in preference to the construction of "hideous reservoirs" in the Thames Valley. He characterized the proposed allocation of seats on the Water Board as a gross injustice to London. However, though his Committee did not agree with some of the suggestions of the Commissioners, they were willing to "effect a compromise;" and they thought that, as a first step, the Government should be approached with reference to the Council's Bills. Mr. Harris, as leader of the Moderate party, could not understand upon what lines they were to go to the Government. He pointed out that the Commission had condemned the policy of the majority of the Council. How, then, could they ask the Government who had appointed the Commission to sanction the carrying out of that policy? He thought the object of the deputation should be to endeavour to obtain some definite action on the broad lines laid down in the report of the Commission, rather than to discuss the Council's Bills. He moved an amendment to this effect, and Mr. Beachcroft gave support to it. Mr. Whitmore, while expressing satisfaction at the conciliatory tone of Mr. Dickinson's speech, denied that the London Conservative members were acting as obstructives on the water question. He, however, appeared desirous of holding out the olive-branch; for he invited the Progressives and the Moderates to join hands in trying to get the Government to deal with the water question on the basis of the conclusions come to by the Royal Commission. The suggestion was a good one. There has assuredly been enough wrangling and waste of money over this matter. The present may, as Mr. Whitmore suggested, be an opportune time for sinking all differences on a question which should never have been made a party one, and obtaining a satisfactory settlement of it. Sir Arthur Arnold, who has already figured as a conciliator in this connection, offered his congratulations to the Council on their remarkable unanimity on the subject of approaching the Government. Mr. Stuart followed in the same strain; suggesting an addition to the Committee's recommendation which would connect the report of the Commission with the object of the deputation. An appeal was then made to Mr. Harris to withdraw his amendment; but he stubbornly declined to make any answer. His silence was, however, not taken to mean assent; for there was a division on his amendment, which was rejected, and that of Mr. Stuart carried. The Council will now endeavour to have an interview with the First Lord of the Treasury. In the meantime, their Bills, which were down for second reading to-day, will not at present be pressed forward.

The Prevention of Electrolysis is the object of a Bill introduced into the Washington House of Representatives a short time ago by Mr. Joseph A. Babcock. It provides that within 60 days of the passing of the Act all the electric railways in the District of Columbia must file plans for equipping their systems with the double-trolley "or other equally good insulated metallic-circuit system." Within 30 days of the passing of the Act, all electric light, heat, and power companies must file plans to prevent any grounding of their circuits.

The Value of Cyanogen.—At the meeting of the Rochdale Literary and Scientific Society on the 16th ult., Mr. T. Stenhouse, F.I.C., F.C.S., delivered a lecture on "Cyanogen, the Latest Gas-Works Residual." Having shown how cyanogen is obtained from gas, he pointed out that compounds of the substance are required in increasing quantities, owing to the fact that a dilute solution of potassium cyanide is now employed for extracting gold from poor ores and from refuse heaps of previous extractions. After explaining the process by which the compound is used for this purpose, he went on to say that from Rochdale gas about 50 grains of cyanogen are extracted from 100 cubic feet, equal to 2 lbs. of potassium ferrocyanide per ton of coal carbonized. In the course of his remarks, Mr. Stenhouse mentioned that he had devised a method whereby the amount of cyanogen in a small quantity of gas could be readily determined.

A Laboratory Note-Book.—We have received a copy of a useful "Laboratory Note-Book for Chemical Students," prepared by Professor Vivian B. Lewes, of the Royal Naval College, Greenwich, and Mr. J. S. S. Brame, the Demonstrator in Chemistry at the College, and Assistant-Examiner in Chemistry to the Science and Art Department. The authors state in their preface that the book has been prepared without reference to any particular syllabus or examination, and is intended to cover such practical work as a student should be familiar with if he is to have a good groundwork in the subject of practical chemistry. It is essentially for the laboratory bench; and the primary object of the compilers has been to place in the student's hands a note-book which shall contain all necessary working directions—leaving to him, as far as possible, the theoretical explanation of the chemical reactions which ensue. The book is published by Constable and Co., Whitehall Gardens.

The Safety of the Staines Reservoirs.—In the "JOURNAL" last week (p. 596), reference was made to the alarmist letter on the above subject by Mr. Shaw Lefevre which appeared in "The Times" on the previous day. The object of the letter was perfectly obvious. Our readers are aware that the Staines works are being carried out by Messrs. John Aird and Sons, for the Reservoirs Joint Committee, in accordance with plans prepared by Messrs. Hunter and Middleton, the Joint Engineers to the Committee; and in a letter in yesterday's "Times" the eminent firm of Contractors, who have in hand the gigantic works on the Nile, expressed themselves as follows on the Staines scheme: "We have no hesitation in saying that the works when constructed will be complete in all respects, and amply sufficient, both as regards the strength of the banks and the puddle wall, to stand against any pressure they may have to carry. For the last forty years we have been constructing reservoirs, not only in the Metropolitan district, but throughout the country, and cannot call to mind any engineering work of a similar kind which in all details is more complete."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 695.)

BUSINESS on the Stock Exchange last week was on a very limited scale, taking the markets all round. The public are still holding their hands, and doing next to nothing. The general tendency was steady, though at the opening some little anxiety prevailed lest the cancellation of the Queen's visit to the Continent should have any political significance. This was soon allayed, and a better feeling set in, especially over the Budget developments. Thenceforward to the close extreme quietude ruled; the issue of the new War Loan being awaited with much interest, and several dealings in it at fair premiums being effected before its exact terms were published. Votaries of the golden calf worshipping the unknown god! Prices are not uniformly higher by any means; but Consols had a nice rise. The other gilt-edged securities were much neglected; being quite overshadowed by the War Loan. This came out on the closing day, and made a very busy Saturday. The premium advanced considerably; and there is every prospect of an immense subscription, with the inevitable result that many applicants will be disappointed. The Money Market has been extremely brisk, affected not only by the Loan, but by large operations in produce clearance to anticipate the new Budget imposts. Business in the Gas Market was brisk; and some of the leading issues were quite active. There was no settled tendency; movements being irregular, and there being almost as many in one direction as in the other. In Gaslight issues, the ordinary opened at 106; and after a little hesitation began to give way, gradually falling to 103⅝, but the closing mark was 104½. The attempt made in the House of Commons to burke the Company's Bill happily failed; and the measure will receive fair consideration in Committee. The secured issues were quiet and strong. South Metropolitan showed renewed animation, and, after changing hands at 134¼ on the opening day, commanded 137 on Thursday, with a rise of two points in the quotation. A few bargains in Commercial old were marked at good figures; and the debenture stock advanced a point. Hardly any business was done in the Suburban and Provincial group, except in British; and prices were left standing. In the Continental Companies, transactions were only limited; and things ruled flat—Imperial receding, and Union doing the same in a greater degree. Slight changes for the better in Bombay and River Plate were the feature among the remoter undertakings. In Water, business was quite as limited as usual; and there were no movements, except in Kent, which was set back considerably. It is believed this was owing to some misgiving (probably unfounded) as to the continuation of payments in respect of back-dividends.

The daily operations were: Gas opened fairly active, and movements were favourable. South Metropolitan rose 1, and Bombay ¼. Tuesday was brisk; but prices moved the other way. Continental Union fell 4, Imperial 2, and Gaslight ordinary 1. Wednesday's doings were almost wholly in Gaslight ordinary; prices remaining unchanged. In Water, Kent fell 5. Thursday was rather quieter; and only River Plate gained ¼. Friday was but moderately active; and movements were irregular. South Metropolitan advanced 1, and Gaslight ordinary receded 1. In Water, Kent fell 15. Transactions on Saturday were largely in Gaslight secured issues at good figures. Commercial debenture rose 1, and Bombay new ¼.

ELECTRIC LIGHTING MEMORANDA.

The Fire in Maiden Lane—The Facts of the Case—Reflections and Questionings.

THE event of the week in electric lighting circles has been the fire at the Maiden Lane Station of the Charing Cross and Strand Electricity Supply Corporation. Possibly, the sufferers from this conflagration and their friends will modestly disclaim for their trouble anything like the importance that some people might be disposed to assign to it. The official account of the occurrence, which was promptly circulated among the shareholders in order to prevent a panic, merely acknowledges the fact that "considerable damage was done to the works, which, however, is substantially covered by insurance." The lighting of the southern district of the Company's area was "prejudicially affected" for some hours; but by the same afternoon the supply was resumed to the theatres and several other large buildings, and the rest was restored about three days afterwards. The highest praise is given to the Company's Engineer, Mr. W. H. Patchell, to the Secretary, Mr. Wilmot Seale, and to the staff generally for the celerity with which the damage was repaired. The consumers, also, seem to have taken the interruption very good humouredly; and the circumstance of the Company having been able to keep the theatres going, by means of temporary connections with other stations, saved the situation. So far, good; but the incident is full of "morals" for those who would fain persuade themselves that a reasonable degree of immunity from risk of breakdown is among the gains of electric lighting progress. We have committed ourselves so completely to the opinion that reliability of the service is not one of these gains, that we must take leave to discuss the Maiden Lane case from this standpoint, without desiring in the least to reflect upon the Company in any particular sense.

What are the facts of the case, put as briefly as possible? On the night of the 2nd inst., the Maiden Lane station was running as usual, and as it has done for ten years—this being the oldest of the Company's stations. For the information of those who only know the principal thoroughfares of London, it may be remarked that Maiden Lane lies at the back of the Strand (to the north); and that the generating station is opposite to the Hotel Cecil, and in the very heart of the amusement quarter of the town. The work of the night had been done; for by 1.40 a.m. even the Strand district is getting quiet. All was in order, when the night-shift engineer "noticed a smell of burning coming from the vaults below the station, where the cables enter." The machinery still working was going well; and there was no sign of any short-circuit. The pressure on the mains was 100 volts; and the cables were insulated in different ways. Some were covered with vulcanized "bitite"—whatever this may be; others were lead covered, or protected by armoured jute. All the same, scarcely had smoke been seen and smelt before flames burst out, and ran up through the brick channel in which the cables lay to the switchboard in the engine-room, which is of slate mounted on an iron frame. The fire had such hold, and burnt so fiercely, that the men could do nothing but shut down the machines and quit the premises "in haste." Then the Fire Brigade came; and the whole thing was over in a couple of hours. The Engineer, summoned by telephone, was next to arrive; and a cheerful prospect met his eyes. Regarded as a fire, it was only a very small affair—the building being little damaged. Inside, however, the switchboard was completely demolished; the cables were rendered absolutely useless; the generating plant (seventeen motor generators and five steam dynamos) was all damaged; and the leads from the accumulators to the switchboard all fell together, so that presumably the battery will have been considerably injured. Says the "Electrician," in continuing the story of the wreck: "All the cables leading into the Maiden Lane station had first to be disconnected, as they were short-circuiting the network; and the stations at Lambeth and Short's Gardens then took all the load until the evening, when it was found possible to start two of the steam dynamos." Another account states that "there was not a vestige of insulation left anywhere—the wire being perfectly clean;" and that the work of testing and adding the machines to the system occupied all the week. What has not been said, however, until this present, is that indispensable assistance was rendered to the distracted engineers at the station by the district officers of the Gaslight and Coke Company, who, being appealed to, lent lamps and gave all the help in their power to Mr. Patchell in his emergency.

The origin of the fire is unknown. The "Electrical Review" says, on this head, that "there is not one iota of evidence that the fire was an electrical one." If our contemporary imagines that there is any comfort in making a mystery of the matter, it is very greatly mistaken. "A fault confessed, is half redressed." So long as the origin of the mishap now in question remains in doubt, uneasiness and mistrust will exist and spread. Let us know what was wrong, and confidence will be in a measure restored. It will be far better for the Company, if they know the cause, whether it was of an electrical nature or not, to make a clean breast of it. Otherwise, it must be concluded that a bundle of insulated cables charged with a low-pressure current may burst into flames at any moment; and where is the security then? And this is the Company that wants to supply the City of London with a better service of electricity! The example of Maiden Lane is not calculated to inspire confidence in the system identified with the mysterious fire.

There is yet another thing to be considered as a lesson of this fire. Where would the undertaking have been without the supplementary stations at Lambeth and in the Holborn district? An electrical journal remarks that Mr. Patchell had cause to bless his stars for this resource, "as it has enabled a supply to be given to all consumers when some at least might reasonably have expected to have to do without it for a few days." It must be remembered, in order to appreciate the full gravity of this reflection, that the Maiden Lane fire was a small one—not extending to the battery room, boilers, or offices. Yet without the help of the other stations, the district might have been without electricity for a week! It is tolerably safe to say, it would not have been in darkness all this while. Thirty theatres and music halls, and supper-rooms without number, would have suited themselves with light long before the end of the week; and the Electric Lighting Company would have been at a very loose end. This being the prospect, if all the Company's eggs had been in one basket—what is to be said for the wisdom of the new electricity-in-bulk plan of action which the Metropolitan and other London electricity supply undertakings have now in hand? Supposing Maiden Lane to have been at Willesden, or at Rotherhithe, or even in the middle of the nearest coal-field, and assuming it to have been a hundredfold bigger—would the circumstances have been different?

Professor RÜCKER, one of the Secretaries of the Royal Society, has been elected President of the British Association for next year. He is a physicist of European reputation, and was for a time one of the Metropolitan Gas Referees.

A NEW ASPECT OF THE NAPHTHALENE QUESTION.

In the "JOURNAL" for Sept. 5 last year, we were able to point to the good work done by Mr. R. W. Allen, M.A., in adding to our store of scientific data bearing on the naphthalene question. Elsewhere to-day (p. 673) we publish the substance of a paper read before the Society of Chemical Industry, in which Mr. Allen supplements the account we had already given of his researches. Moreover, he is now no longer content merely to collect trustworthy data for the common weal; he advances a theory of the cause of naphthalene deposits in mains which has at least the merit of novelty. As the discussion which followed the reading of Mr. Allen's paper was considerably hampered by the fact that the speakers had had no opportunity of ascertaining previously the trend of his researches, we hope that others will follow the example of Mr. R. Forbes Carpenter, and take an opportunity to renew it in our "Correspondence" columns.

The experimental data, which supplement and correct the table given on Sept. 5 last (p. 595), cannot fail to be of great service. Incidentally, we may point out that they indicate conclusively that the mixture which we know as coal gas, behaves, in so far as capacity for carrying naphthalene vapour is concerned, exactly as air or a simple gas, such as hydrogen. Now, though theoretical considerations would have led us to anticipate this fact, as Dr. Hehner pointed out to Mr. Allen, yet some gas engineers have endeavoured to explain depositions of naphthalene on the assumption that coal gas could not retain so much naphthalene as would saturate a simple gas at the same temperature, because it contained also vapours of other hydrocarbons. It has been shown experimentally by Mr. Allen that the presence of these vapours does not diminish the amount of naphthalene vapour which a gas can retain. Experimental proof of such a point will convince many who would be inclined to doubt the validity of a theoretical deduction from well established general laws; and Mr. Allen has done the gas industry good service in furnishing such proof. We know now, at least, how much naphthalene vapour coal gas under normal conditions is capable of retaining at given temperatures.

Mr. Allen incidentally referred to the fact, already pointed out by us, on Sept. 5 (p. 591), that at about 60° Fahr. his figures coincide with the quantity of naphthalene recovered from coal gas by Dr. Bueb, by washing the gas, as it leaves the tar-extractor, with heavy oil. Consequently, we may draw the inference that at this point on the works coal gas is normally saturated with naphthalene vapour. Therefore, if at any point in the distributing system the gas is found at the same or a lower temperature to be not completely saturated with naphthalene vapour, it is evident that the naphthalene must have dropped out at some intermediate point. If it had been absorbed by tar or by hydrocarbons condensed as liquid from the gas, it would have been removed with the tar or condensation products from the system. But failing absorption by such agents, it must have been deposited in the solid state at some point where a lower temperature or much friction induced the deposition.

Now Mr. Allen, according to his method of investigation, found gas delivered from the service-pipes very nearly free from naphthalene. He has therefore to account for the disappearance of the naphthalene, which undoubtedly occurs in freshly manufactured gas in quantity nearly approaching, if not attaining, the limit of saturation of the gas at ordinary temperatures. Mr. J. W. Helps offered Mr. Allen one explanation of the disappearance of naphthalene—viz., prolonged contact of the gas with the tar; but this explanation was coupled with the information that gas thus treated did not produce naphthalene deposits in the distributing system. The gas which Mr. Allen found to be nearly free from naphthalene was, however, stated to produce such deposits. Here are anomalies, which will need reconciliation before gas engineers can seriously entertain Mr. Allen's hypothesis of the synthesis of naphthalene in the mains. Briefly, unless the records of the oil-washing processes are incorrect, gas under ordinary circumstances leaves the works charged with naphthalene vapour. Because at some point in the distributing system Mr. Allen was unable to trace the presence of much naphthalene, while deposits were found at other points, it is not reasonable to assume that there is no connection between the naphthalene originally present in the gas and the deposits found in the mains. Let us examine the grounds on which Mr. Allen would have us discard so probable a connection in favour of an independent synthesis in the mains of the naphthalene which constitutes the deposits.

According to Mr. Allen, a formation of naphthalene in the pipes themselves would satisfactorily account, among other things, for such facts as the following: (1) That deposits generally occur locally, and in those pipes where the temperature, &c., fulfilled the conditions necessary for the formation of naphthalene. (2) That no naphthalene could be detected in the gas employed in the researches, for that gas may be assumed never to have passed through pipes where the conditions were favourable for the formation of naphthalene. (3) That gas proved to contain less naphthalene as it enters the mains than can ever saturate it at the temperatures to which it will be subjected in the course of distribution, nevertheless causes great trouble from naphthalene deposits.

Perhaps it would have been better if the third of Mr. Allen's facts had been stated before the first and second, as the above order of precedence raises a suspicion that the discovery of conditions under which naphthalene might conceivably be formed in gas-mains preluded the researches which made it appear necessary to explain the occurrence of deposits by such formation. In reality, however, we gather that Mr. Allen first made the latter researches. Therefore, considering the third of his facts first, we are fain to ask if he really did prove that gas *as it enters the mains* contains much less naphthalene than suffices to saturate it at ordinary temperature. We understand that he made his experiments at some distance from the works; and we do not learn that he ascertained that the gas had not deposited naphthalene in the mains traversed by it. Far more convincing proof than Mr. Allen has yet offered must be adduced in support of this statement.

The first and second of the facts set forth above are both made to depend on the existence in the mains of conditions favourable to the formation of naphthalene. We may therefore suppose that Mr. Allen is acquainted with these conditions, and that they do not necessarily comprise the prevalence of a higher temperature than frequently occurs in gas-mains. Hitherto naphthalene has been regarded as a condensation product obtainable from hydrocarbons of less complex structure at high temperatures only. Mr. Allen leads us to infer that a high temperature is not essential in the synthesis of naphthalene from the other constituents of coal gas. Moreover, he hints that one of the reacting substances in the synthesis may not exist in the gas as it leaves the works, but perhaps is formed in the mains. Beyond this he is reticent; and we cannot blame him for keeping silence regarding what may prove to be a discovery of great commercial value to him. But he has whetted the curiosity of all interested in the naphthalene question—both theorists and practical men—and they naturally seek to divine his views.

Mr. Allen's allusion to one of the reacting substances as possibly being formed in the mains, implies either that it is a product of prolonged contact of two or more constituents of the gas, or that the mains themselves play a part in the formation. If prolonged contact of constituents matters, then the formation of naphthalene would be greatest where the rate of flow of gas was not rapid and the distance traversed was great. We have not heard that such conditions always prevail where naphthalene deposits occur. If, on the other hand, the mains themselves have any influence, we recall at once the peculiar volatile compound of iron which is produced when a gas containing carbonic oxide passes through iron mains. Now as carbonic oxide occurs in larger proportion in water gas than in coal gas, this compound—iron carbonyl—is produced in greater quantity during the distribution of water gas than of coal gas.

Mr. Allen nowhere speaks of water gas; and many gas engineers—though not all—find that with the introduction of carburetted water gas naphthalene deposits disappear from the distributing system. Iron carbonyl, however, comes very near to fulfilling one condition of the synthesis of naphthalene in mains—viz., that it is decomposed at a comparatively low temperature, though we do not recollect that the precise temperature of its dissociation has been determined. Neither have we heard that it reacts with hydrocarbons or other bodies present in coal gas, though, if any such reaction did occur, it is likely that it would happen at a temperature lower than that of the simple dissociation of the carbonyl. But iron carbonyl has been so little studied that it would be impossible to deny that it might react with some other body in coal gas at temperatures which might prevail in the mains. Even though it plays no part in the synthesis of naphthalene, which takes place, according to Mr. Allen, in gas-mains, it is worthy of further study at the hands of gas engineers and chemists; for it is believed to be responsible for mineral-like deposits within the tips of steatite gas-burners, which deposits become more prevalent wherever carburetted water gas is introduced. That iron carbonyl can, however, affect the formation of deposits of naphthalene is at present mere conjecture. We must regard all the three facts set forth above as requiring substantiation.

Mr. R. Forbes Carpenter, in our "Correspondence" columns to-day, asks the pertinent question whether naphthalene deposits have been found to occur in mains fed only with gas previously freed from naphthalene. If they do occur, Mr. Allen's views have substantial support; if they do not, his theory loses its practical importance. Perhaps someone acquainted with the Burnley and Dessau trials will be kind enough to give definite information in regard to this point.

Mr. Allen deserves the thanks of the gas industry for a highly suggestive paper, for valuable scientific data, and for a useful method of estimating naphthalene in coal gas. His views will certainly meet with more severe criticism than was accorded them in the discussion which followed the reading of the paper; but we sincerely trust that he will be encouraged to pursue his researches on the subject, even though a discovery of immense commercial value be not yet within his grasp.

MM. Léo Vignon and Louis Meunier have communicated to the Paris Academy of Sciences a rapid method for determining the carbonic acid contained in various gaseous mixtures. It is only applicable to gases which can be obtained in unlimited quantities, such as air or coal gas; and it consists of a titration with lime water tinted with phenolphthalein.

RETORT-SETTINGS OF 1850 AND 1900.

WHATEVER else of all the long and expanding array of gas-works plant and machinery may captivate for the time being the interest of the thorough gas engineer, retort-settings must remain his chief attraction, if he is to be true to his salt. The retort is the elemental force of every gas-works, large or small; and, all other things being equal, those gas managers who feel this truth most, and best appreciate all its consequences, are the most efficient in their calling. There is, besides, this unique distinction in the retort—that it is the technical atom to which coal carbonizing plant of every size is reducible. No gas-works can have less than one retort; and it matters very little how many retorts there are in a works, as regards the standard of efficient carbonization. One retort may be worked to better purpose, having regard to the circumstances, than a thousand. Consequently, all gas managers stand upon common ground when it is a question of retorts and retort-settings. If there is any difference, the palm of mastery could most often be awarded to the man of moderate means in this respect. Many of the acknowledged experts in retort-setting and management have come out of small works, where everything has necessarily been done under their own eye. There is, of course, no rule for this; and both bad and good retort-setting can be—or used to be—found in works of all sizes. We relegate this reproach of inequality to the past advisedly; because there has of late years been a marked levelling-up of retort-setting practice, in connection with the universal adoption of gas-fired settings. This general result has followed from the fact of gas-firing being a strictly rational proceeding. There could be no "rule-of-thumb" about a gas-fired setting. Neither could there be in designing it any blind faith in the elementary science of text-books upon "Heat." Success had to be felt for, step by step, after its possibility was known; and incidentally the whole practice of retort-setting was resettled on a truly scientific system, which consisted simply of recognizing the needs of particular cases.

At the present time, it is not saying too much to declare that there exists a body of science centering in the gas-retort which has grown into being during the last twenty years. When a young student of gas manufacture is first confronted with a particular example of carbonizing practice, it takes him much time and hard study to ascertain and understand the reasons for it all. Hardly, perhaps, has he succeeded in obtaining a dim mental picture of the course of evolution of the retort-house patterns he sees before him, when a visit to another works threatens to upset his reflections altogether, by showing how differently the same problem may be worked out in other places. But is it really the same problem? That is another question, the very existence of which the neophyte did not suspect. And how is a mere student to make proper allowances for the various factors of local talent, or stupidity; of financial pressure, or the opposite; of the score of influences which, avowedly or beneath the surface, mould the development of this branch of gas engineering practice in different localities?

An interesting relic of a bygone stage of this development has reached us in the shape of an original pen-and-ink drawing, dated 1850, of "Crosthwaite's system" of setting three retorts, the chief characteristic of which is the use of moulded fire-clay blocks for supporting the retorts. The reduced reproduction of this sketch appearing in another part of the "JOURNAL" (p. 679), shows the simple retort-settings of those days, and how little went to make a "system" of the period. Mr. John Crosthwaite, the designer, was Engineer of the Carlisle Gas-Works, and the gas was made here by means of such settings. It is stated, in a letter accompanying the sketch, that the furnace is seven fire-bars wide, and 2 ft. 6 in. long. It was very shallow, and must have needed continual stoking. The fire must have been very fierce, and the local heat intense, as Mr. Crosthwaite says, "the more supports the better, especially at the fire-place." His reason for preferring block supports to brick-piers was the liability of the mortar to be burnt out of the joints of the latter, when they would give way. This also shows how strong a heat was kept up. These retorts were 7 ft. 3 in. long, by 16 in., by 14 in. Out of the 13 cwt. of coke made per ton of coal carbonized, there was used 5 cwt. for fuel, or 38½ per cent., as Mr. Crosthwaite put it. The retorts were probably of cast iron, although nothing is said on the subject. It is, however, a typical iron retort-setting, though the usual seating of fire-tiles running the whole length of the retorts is absent. There was a reason for this omission; Mr. Crosthwaite remarking that he had tried the tiles and found them crack and fall down into the fire. On the whole, therefore, it does not seem extravagant to classify this particular setting of retorts as marking the high-water line of practice in this connection, which occurred, as is natural, just before the new fashion of fire-clay retorts became established, and the iron retort was definitely relegated to use in the decent obscurity of private gas-works of country houses.

Mr. Crosthwaite's sketch and descriptive letter have been religiously preserved; and an opportunity now offers of comparison with Drake's system, pattern of 1900, for setting three clay retorts with a regenerative furnace. No detailed description of this system is needed, inasmuch as the sectional elevation exhibits it all to the practised eye. We do not put this system forward as the best of its kind, still less as representing the ultimate possibility of retort-setting on a small scale. It happens, however, to be a setting of threes, like Mr. Crosthwaite's; and it is conspicuous that, except for the number of the retorts and the circumstance of their being enclosed in an arch with side piers, the two beds of retorts have nothing in common. It is such contrasts as these that enable one to perceive the fact and the course of technical development, which is oftener taken for granted than completely understood. It is unnecessary for us to dwell upon the differences in detail. This exercise may well be left to students. Expert readers will, of course, see the distinctions, as well as the differences, at a glance; but it will be no bad exercise for learners to pick them out for themselves. An essay of handsome proportions might be written on the character and purpose of these changes.

There is good reason for the belief that the gas-retort is likely to remain the cynosure of gas engineering attention for a period as long as any practical man need think about. This being the case, it would seem to follow that the study of it should be followed up to the limits of ascertainable knowledge. The gas-retort is to the gas manufacturer what the dynamo is to the electrician, or the steam-boiler to the mechanical engineer. Yet it may be doubted whether it is treated with equal respect. The electrician should know all about his dynamo. He knows at any rate how much duty he can expect from it; and the machine will not disappoint its makers, unless it should be called upon to do utter impossibilities. Similarly with the steam-boiler. Sir Frederick Bramwell long ago, and workers like Mr. Bryan Donkin in later years, have taught the world how to gauge the value of this rude means of turning fuel into a source of power. But nobody has much to say for the gas-retort as a tool. Granted that the experimental study of the performances of gas-retorts in action is not easy, nor pleasant; still, this is no justification for tacitly neglecting it. Take, for example, the thoughtful disquisition upon retorts and retort settings in "King's Treatise," Vol. I., Chapter 5. How much more is really known concerning the data of heat utilization in coal carbonization than was accepted when this chapter was written? Consider these simple questions alone: Should a gas-retort be made of heat-conducting material, or not? If this is of no consequence, from what proceeds the superior efficiency, if any, of thin retorts? It is impossible to read the chapter in question without perceiving how purely empirical retort-setting practice still is.

We do not forget that we have already called the gains of modern carbonizing practice a body of science; and so it is. How, then, can the practice itself be empirical? Very easily; for there is no incompatibility between science, which is systematized knowledge, and the method of trial-and-error, which gives us the knowledge to be systematized. It is matter of common knowledge, for example, that in practice it is impossible to carbonize coal in externally-heated retorts without burning a certain amount of fuel in doing the work. A good deal of both theory and experiment have gone to the hammering out of the answer to the question that follows upon this general statement—the query, how much? But when one comes to ask further, why it is necessary to burn this rated quantity of fuel, there is no answer. Several attempts have been made to draw up the balance-sheet of a retort setting. So much of the heat of the fuel gone in conduction, so much in convection, so much gone up the chimney, so much to roasting the coal—but is there any such estimate that is really trustworthy? Let us put the question on the simplest possible basis, by way of showing the way of beginning. Will any student of gas manufacture send to the "JOURNAL" a certified statement, based on experimental proof collected by himself, of the relation between the fuel consumption of a retort-setting and the weight of coal carbonized by it, *de die in diem*?

It is an old criticism that the pyrometer is not employed in gas retort-houses as much as it should be. The same may be said of the various appliances now so readily available for determining the quality of the combustion in the furnaces by the composition of the waste gases. The freest employment of all these means of instruction may not teach us much; but where nothing of the kind is used, there is no truly scientific knowledge of what is being done. Without systematic checks and investigation of results, the most artful devising of regenerative retort-settings is as much guess-work as the unwritten rules that were followed, half blindly, by the old retort-setters of a past generation. Before we smile at the simplicity of Mr. Crosthwaite's "system" of 1850, therefore, let us be quite sure that we know why that which has come after it is to be preferred.

THE BOARD OF TRADE RETURNS FOR FEBRUARY.

THE Board of Trade returns of exports and imports during the month of February show an increase in the foreign commerce of the country that—taking into account the fact that we are now comparing with a period that was itself noteworthy for the improvement witnessed in trade—is very remarkable.

The value of the imports for the month was nearly 8 per cent. higher than in 1899; while the exports showed the striking increase of 19·8 per cent. over the corresponding month last year, although the exports then were close upon 10 per cent. more than in 1898. The total estimated value of trade with other countries for the month was 66·4 millions, compared with 60·8 millions last year. The great increase in the value of exports was mainly

under the headings of raw materials and metals. The estimated value of metals and articles manufactured therefrom (except ships) exported was 5·30 millions, as against 3·96 millions in 1899. No small part of this rise was due to the prevailing high prices of iron and steel goods; but the tonnage figures, especially those for pig, bar, angle, and cast iron, also continue to increase. If, as seems most probable, the orders already in hand, together with those that must of necessity be placed from time to time, should carry on the iron and steel trades in their present state of activity until the development of industry in South Africa, consequent upon the cessation of the war (which is now, happily, possible at a much earlier date than seemed probable a month since), shall give that activity a fresh lease of life, the duration of the season of high prosperity in these industries will have exceeded all precedent. The increase of the value of raw materials exported is due almost entirely to the coal trade with the Continent; the high prices not having as yet checked the flow of coal out of this country. The quantity of fuel exported for the month was 3,333,664 tons, valued at £2,680,608, as against 3,196,848 tons in 1899 and 2,518,751 tons in 1898, valued at £1,629,426 and £1,165,939 respectively. The heavier demand came from France, Germany, Holland, and Russia—naming them in the order of tonnage imported. The value of the coal sent to France was rather more than double that of her imports in February last year. It is noticeable that there is a falling off in the quantity sent to most of the countries not affected by the special conditions of trade and the labour market existing in three out of the four countries named above. The chief source of the enhanced imports was the increase in the shipments to this country of raw materials for the manufacture of textile goods—an industry that always displays great activity during seasons of prosperity and high wages.

Altogether the trade returns are, from a patriotic point of view, most satisfactory, especially taking into account the additional burdens which the country will have to bear, as the cost of the war, during this and next year. Whether coal buyers can regard them with enthusiasm, is quite another question.

AMERICAN COAL IN EUROPE.

In recent articles dealing with the coal resources of this country, it was pointed out that our commercial prosperity depends, not merely upon our ability to produce coal sufficient for our requirements, but, further, upon the production of that coal at a reasonable cost. The extreme penalty we should have to pay were the price of coal increased (by the cost of raising) to a figure much in excess of past averages, would, as was said, be the importation of coal from America. The earlier and more imminent penalty would, however, be the serious blow to our iron and steel industries entailed by the displacement of English by American goods—not merely in foreign, but in our own markets—on a much vaster scale than hitherto. It is already the case that iron and steel can be produced in America at a lower cost per ton than in England, and that the cost of freight is the only protection of our home industries other than the superiority of British workmanship—a fact which renders the present state of the coal market, and of technical instruction in this country, matters of vital importance to the community.

It is a point of great significance for the future that the coalfields of the United States are practically inexhaustible, having an area estimated at 196,650 square miles, as compared with somewhere about 5500 square miles in the United Kingdom; and, further, it must not be forgotten that, thanks to the short-sighted folly of our own coal miners—and of not a few of our coalowners—coal can be raised at less cost per ton in America than here, other conditions being equal, owing to the adoption there of coal-cutting machinery. In this country, such employers as have sought to introduce these machines have failed in the attempt, owing to the determination of the men that they should not be successful. It is the old fallacy over again, that limitation of trade is of ultimate advantage to the labourer.

We must not be misunderstood as prophesying the actual competition of American coal with English in our home markets within measurable distance of time. The point we wish to make is that any lengthened maintenance of prices at their present level must give our great competitor an opportunity, which he will not be slow to seize, of ousting English coal out of foreign markets. The process has, in fact, begun; for, in spite of the difference in freight, large quantities of best steam coal from the United States are now being delivered at Italian and Austrian ports at much lower prices than those at which Cardiff or Durham coal can be there imported.

It is, indeed, in this influx of American coal into Europe, and its displacement of Welsh coal at many foreign coaling stations, that we see the earliest promise of an easement of the English market. For it must be remembered that the hardness of that market is due as much to the large increase in our exports of coal as to the increased consumption at home. Every ton, therefore, of American coal imported into Europe, tends to release a ton of our output for the home market. Herein lies the radical difference between the present situation and that of 27 years ago, when coal was as dear as it is now. Then the scarcity was due very largely to the demand for iron from America, and neither the coal nor the iron output of the States was a third of our own. Now the demand is at home and on the Continent; and not only are the outputs of both coal and iron in the States greater than those of this country, but America is now (what she was not then) an exporter of metal goods and of coal.

The condition of the European market is both interesting and peculiar, and would have received much greater notice at the hands of the general Press had not attention been so much preoccupied with African affairs. France, Germany, and Austria have all been seriously handicapped by labour troubles in the coal trade, at the same time that industrial activity, not unconnected with warlike preparations, has increased the demand for fuel. The Austrian production has, indeed, been almost brought to a standstill by a strike of miners in Bohemia and Moravia, with the result that she is drawing heavily from Germany. The consequence of this is that Germany is importing more and more coal from this country, and that an agitation is on foot there to prohibit the export of fuel entirely. Russia needs so much coal for the purposes of her vast railway projects, that it has been necessary to suspend the import duties; and she is now a pressing buyer in English markets. All this has led to a panic cry in some circles here for the placing of an embargo upon exporting coal—a step which, as Mr. Goschen said in his speech on the Admiralty programme, it is "entirely impossible" to consider until war breaks out with a naval power, or "until an emergency of a totally different character from the present, one arises." The check on our exports, when it comes, will come from without, not from within; and as reports from the American pig-iron markets point to production overlapping consumption, and the output of coal there is rapidly increasing this check may come sooner than some people now think. It is chiefly the difficulty of chartering the necessary shipping that is delaying the importation of American coal into Europe by the million, instead of by the thousand, tons.

THE LIABILITY OF AUDITORS.

On Jan. 26 last, judgment was given in the Irish Court of Appeal in the case of *The Irish Woollen Company, Limited, v. Tyson and Others*, which was mentioned in these columns last August (in reference to the original trial in the Court of Chancery) as being of much importance to auditors and the investing public.

The history of the Company in question is, unfortunately, only too familiar, in its main features, to that of many other joint-stock enterprises. It was formed in 1887 for the purpose of promoting the woollen industry in Ireland. Two years later it was announced that it had been decided to extend the business; and for this purpose fresh capital was required. The prospectus then issued alluded to the success that had attended the operations of the Company up to that time, and foreshadowed more brilliant prospects for the future. The accuracy of the prospectus may be gathered from the fact that the whole of the additional capital was required to make good previous deficiencies, and to pay dividends which, from 1888 to 1895, never fell so low as 5 per cent. In 1895, the bubble burst; and the Company was ordered to be compulsorily wound up. It was then found that, although the business was just solvent as regards its creditors, the capital had entirely disappeared. It was sought to make the Auditor—a Mr. Kevans—liable for damages to the shareholders, for having failed to detect the system of incorrect book-keeping by which the fraud was made possible. The Irish Master of the Rolls found against the Auditor, who appealed; but the judgment has now been upheld by the Court of Appeal.

The fraud in this case is of a nature by no means uncommon at the present time; it is, indeed, very similar to that practised by the officials of the Millwall Dock Company. That is to say, the purpose of the manipulation of the accounts was not simple robbery—it was not misappropriation of monies to the personal use of the defrauder, but it was done for the purpose of giving an appearance of prosperity to a losing concern. It was a case of "living on capital"—a course of procedure always dangerous, and sooner or later calamitous, but for a small company (such as that in point) bound to be speedily fatal. The method by which the true state of affairs was concealed was mainly that of "carrying-over" to the accounts of one year invoices for goods supplied during a preceding year. This the Auditor would have discovered had he examined the creditors' ledger accounts with the invoices rendered. The question for the Court was whether, in not detecting this "cooking" of the books, the Auditor had so far failed in his duty as to render himself liable for damages.

Lord Justice Holmes, in giving judgment against the Auditor, said that he "did not understand how the carrying-over of the invoices could have escaped detection by the accountant, who should have used due care and skill, and who was not a mere machine. . . He considered that not only were Mr. Kevans and his assistants not free from blame for this, but also for the mechanical way the audit was carried out." Lord Justice Fitzgibbon, in concurring, quoted, from the well-known judgment in the case of the London and General Bank, the definition of an auditor's duty as being "to ascertain and state the true financial position of the company at the time of the audit." He is to ascertain that position by examining the books of the company; but he does not discharge his duty by doing this without inquiry, and without taking the common trouble to see

that the books show the company's true position. "Otherwise the audit reduces itself to an idle farce." The most important point in Lord Justice Fitzgibbon's judgment lies in his conclusion, where he sums up the case by saying that the Auditor and his assistants were deceived, "not by any glaring or probable fraud such as they might be on the watch against, but by a thing done for the purpose of giving an appearance of fictitious prosperity to the company. . . That, however, cannot alter the legal liability if it is based, as I am satisfied it is, upon the failure to have suspicion aroused."

This declaration that an auditor is not only bound to investigate anything that arouses his suspicion, but is negligent if he do not suspect what a careful examination of the books would lead an intelligent man to suspect, is very satisfactory to the investing public. We have frequently urged that no auditor adequately discharges his duty unless he goes below the surface of the books and vouchers put before him, and satisfies himself of their genuine character. The fact that auditors are legally, as well as morally, bound so to do, and run a risk of being cast in damages if they content themselves with a less thorough scrutiny, should serve to arouse to an increased sense of their duty, and to the possible consequences of its neglect, those auditors (and they are many) who conduct their audits in a mechanical, an uninquiring, and an unintelligent manner. Companies who are anxious to keep up "an appearance of fictitious prosperity" by the gentle art of living on capital are not as scarce as Auks' eggs.

PERSONAL.

Mr. T. Jowett, of Milton, Gravesend, has been appointed Manager of the Solihull Gas-Works.

Mr. Brooke Gibson has resigned the position of Engineer and Manager of the Sittingbourne District Gas Company.

Mr. W. Lister, of East Ardsley, has been appointed Manager of the Llanrwst works of the Holyhead and North Wales Gas and Water Corporation.

Mr. R. Porter, of Elland, who was Consulting Engineer to the Skipton Gas Company, has been retained by the District Council, who have acquired the undertaking of the Company, to act in a similar capacity for them.

Mr. F. W. Ward Holland, Assoc.M.Inst.C.E., has been appointed Water Engineer to the Cape Town Corporation. He was formerly Engineer of the Brighton Corporation Water Works, and has practised privately in England.

The Gas Committee of the Greenock Corporation on Tuesday agreed, by eight votes to four, to recommend the appointment of Mr. John Chalmers, collector in the burgh, for the post of Manager of the Corporation gas-works which is being vacated by Mr. S. Stewart.

Mr. James Lyon, who fills an important post under the Glasgow Corporation Gas Committee, was last night entertained to supper, and made the recipient of valuable presents, including a purse of sovereigns and a piece of silver plate, the total value of which was upwards of £120, in celebration of his completion of fifty years' service; he having commenced with the Glasgow Gaslight Company on Feb. 13, 1850. The amount named was collected chiefly from the workmen in the employ of the Gas Commissioners and from the Gas Committee (£10). Mr. Lyon is paymaster to the employees in the various departments; and a large number of them met in the saloon of the City Hall last night, with great rejoicing. Bailie Fife presided, and there were present several members of the Corporation Gas Committee, as well as Mr. Foulis.

OBITUARY.

Mr. William Brown, the Chairman of the Chester and Hawarden Water Companies, died somewhat suddenly from heart disease last Wednesday. He held a very prominent position in Chester, and had been twice Mayor.

The death is announced of Alderman John White, J.P., the "father" of the Hartlepool Town Council. Deceased, who was upwards of eighty years of age, was first elected to the Council in 1860; and in 1874 he filled the office of Mayor. He was Vice-Chairman of the Hartlepool Gas and Water Company.

The death is announced of Alderman J. Maltby, J.P., of Lincoln. Deceased was one of the prime-movers in the purchase of the water-works by the Corporation; and when the undertaking was transferred he became Chairman of the Water Committee. He was 69 years of age, and had ungrudgingly devoted 40 of them to the service of the city.

We regret to record the death, after a few months' illness, of Mr. John W. Buckley, Engineer and Manager of the Formby Gas-Works. Deceased had been connected with the gas industry for upwards of fifty years, seventeen of which had been passed at Formby. Prior to going there, he was for many years in the Gas Department of the Southport Corporation. He joined the Gas Institute in 1885, and the Manchester District Institution in 1891. He leaves a widow, three daughters, and four sons, three of whom are in the gas profession. The funeral takes place to-day.

COMMUNICATED ARTICLE.

GAS COMPANIES AND PERIPATETIC GAS-TESTING.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

Although the use of the portable photometer has been recognized from time to time in connection with the work carried on by the Metropolitan Gas Referees, and has met with some degree of support, I am not aware that a case has ever been distinctly stated on behalf of the instrument and the system identified with it, the principal feature of which is that no testing-room, as generally understood, is required. Under the present arrangements, gas can only be officially tested in certain specified rooms fitted up for the purpose. But with the portable photometer, the specified testing-place becomes a superfluity, as any locality within a yard of a pipe charged with gas supplied by the company whose product is to be examined may be utilized for that purpose. I say supplied by the "company" advisedly, because the benefits attainable by the use of the photometer on wheels do not appear to have attracted attention in districts where the gas-works are the property of the municipality. Many gas engineers have been looking for some authoritative pronouncement, showing not only the deficiencies of the present system, as regards a fair presentment of the interests of the consumers, but also the advantages of the new one in assisting the gas examiner towards a fair and impartial discharge of his duty, which is simply that of holding the balances fairly as between buyer and seller. Neither of the parties concerned requires more or less than this. While they do not wish the scales to be tipped in their favour, they would equally resist a stroke in the other direction.

But a great deal more hangs on the present arrangements for examining the illuminating power of the gas supply, than a mere adjustment of quality as between one side of the counter and the other. It has been adopted as an integral factor in the bargain between the sellers of gas on the one hand and Parliament as representing the public on the other, which is known in well-informed circles as a "Special Act" or "Provisional Order," but to the majority of the public under the incorrect and misleading title of a "monopoly." Important questions relating to price and dividend are dependent upon it. The *status quo* of the present system must be maintained, if justice is to be adhered to. Sixteen-candle gas is not a mere nonentity or will-of-the-wisp, but a tangible article that can be accurately defined, not only by the test of the photometer, but by the aid of chemical analysis, and by the materials and processes concerned in its manufacture. I do not wish to do any injustice to the peripatetic system. But high authorities have repeatedly asserted that the object of introducing it is to score strongly at the expense of the gas companies, by forcing them to supply gas at least 20 per cent. above the standard, in order to guard against its irregularities; and I do not know that this impeachment has been contradicted. At present, the nominal 16-candle gas is actually 17½ to 18 candles; but with the portable photometer on the war path, the company would not be safe at even 19 candles. The gas companies are, in effect, to be compelled to supply a more costly article, while all other conditions of the bargain remain as before. Even if we grant that the present arrangements are inefficient, and that the portable photometer is perfectly fair as between buyer and seller, it is still a fact that the introduction of a not necessarily more rigorous, but a more uncertain, method of testing would be an injury and an injustice to the gas companies, as amounting to a breach of the parliamentary bargain.

While it has never been proved that the present arrangements for examining the gas supply are unduly favourable to the seller, and therefore prejudicial to the interests of the buyer, it is by no means uncertain that the portable photometer has a strong leaning in the other direction. One might almost add that this is its most favourable feature, in the eyes of its supporters. Any competitive photometrist, armed with a portable photometer and strict instructions to prove a conviction against the gas company under pain of the gallows, could save his neck, even if the quality of the gas was not less than 10 per cent. over the standard. These remarks are justified, because one claim in favour of the new plan is that the results obtained by its means are always below the indications recorded in the official testing room. But this is capable of two interpretations. It may, as assumed, be so much the worse for the gas; but, with at least equal probability, it may be so much the worse for the wheel-barrow photometer. Such a conclusion is favoured by the irregular and widely varying readings obtained, because gas manufacturers, whatever their other faults may be, find it necessary to maintain uniformity of quality. If they sent out 14-candle gas on Monday, 17-candle gas on Tuesday, and 15-candle gas on Wednesday, the manager and his staff would find that life was not worth living on Thursday. If the portable photometer could be depended upon to trot along at a regular distance—say, 10 per cent.—behind its stationary relative, it might be possible to make something of it. When Mr. Sugg improved the standard argand burner, the parliamentary standard was raised in proportion. It was stated to get 2 candles more out of the gas; and so the standard was lifted from 14 to 16 candles—not as a means of scoring at the expense of the gas companies or increasing their responsibilities, but simply to preserve the position unaltered, and secure a gas in all respects equal to that

previously supplied. But it is impossible to base a fair and square bargain on the indications of an instrument that runs at anything between neck and neck and a 25 per cent. deficit; and an adjustment of this nature could not be applied to the portable photometer. If the "portable" standard was put at 14, as compared with the "stationary" 16 candles, there would still be the element of uncertainty, due to the fact that the peripatetic system is intrinsically unfair as against the seller, and contrary to the spirit of similar legal enactments.

The statutory enactments which govern the testing of gas are an example of the class commonly known as the Adulteration Acts, which are framed with the object of securing that the free and independent, but ignorant (in a technical sense), Briton shall get full value for his money, and that the goods supplied to him shall be equal in value to a known standard. Gas is compared with the standard sperm candle, bread is put into the balances against an avoirdupois pound weight, whisky is tested for percentage of alcohol, butter is examined for the presence of inferior animal fats, coffee for chicory, &c.—all for the purpose of securing to the purchaser, when he spends a shilling, a fair shilling's worth in exchange. They do this and no more. He pays his shilling, and gets twelve pence value, and cannot claim anything between twelve and fifteen pence. Obviously the whole of the gas, bread, butter, whisky, coffee, &c., supplied to the public cannot be examined, just as the whole contents of a steam cargo boat may be passed through a custom-house. So the first step in drafting any Adulteration Act is to arrange for obtaining some small samples as a representation of the whole; and elaborate precautions must be taken to secure a fair sample. The true intent and meaning of the Acts is that the sample should be taken in a manner that is just to both parties, the seller as well as the buyer.

As regards gas, the photometer must be connected by a short service to one of the principal main-pipes, and the gas must be lighted at least 15 minutes before the test is taken—which, in effect, means that the service-pipe, meter, governor, &c., must be flushed out, and the test conducted upon a sample of the gas that is piping-hot from the main itself, and therefore a fair sample of the bulk. The gas company are entitled to have a representative present at the test, which means that they have a right to see this important condition fairly carried out, and generally that their interests are not prejudiced—inadvertently or otherwise—by any action on the part of the operator. With a similar object, the samples of bread, whisky, or butter are taken in a manner calculated to secure fair play all round. They must be purchased over the counter or from the delivery van in the ordinary way of business; the seller must be informed at the time that the sample will be analyzed, and he can if he chooses retain a portion of the same; the selected portion must be examined with the least possible delay; and so on—all with the view of guarding against a tip of the scales either one way or the other.

So far gas companies, as well as other traders, have been satisfied as to the taking of the sample. But bakers, publicans, and grocers would all very strongly object if, as a so-called improvement on the obviously fair methods of performing this operation, the inspector was allowed a free hand, and could go to any customer, and take samples of bread, whisky, or butter, without regard to the period of time that had elapsed since they left the tradesman's establishment, or to the treatment accorded to the commodities subsequent to their delivery. The baker would point out, with good show of reason, that the bread might have been placed in a warm corner, or otherwise so treated that it had lost weight considerably; the publican would suggest that the whisky bottle might not have been properly corked, with the result that its strength had been reduced by evaporation; and the grocer would ask for proof that the butter had not been tampered with, or exposed to dust or moisture, after leaving his shop. Strong objection would also be raised if the inspector was accompanied by an analyst and a trundling laboratory, prepared to make essays and write out a report on the spot. It would be said that the operations incidental to analysis were of a delicate and elaborate character, and could not be properly conducted except in a suitably fitted room.

All these objections can, and should, be urged by the sellers of gas. The portable photometer system leaves the method of taking the sample entirely to the discretion, not only of the examiner, but also of the individual consumer, who may be hostile to the company, or for personal reasons may wish to score a point against them. There are those who seek to obtain or to retain the public favour and confidence by striking the attitude of a doughty champion on their behalf, and who are occasionally driven to the necessity of dressing up a bogey antagonist. Failing other things, the gas supply can be utilized for this purpose. One admirable feature of the present systems, both for the testing of meters and the illuminating power of gas, is that the item of personal discretion is reduced to a minimum. All that is necessary is to follow the prescribed regulations with accuracy and conscientiousness. Care has also been taken to reduce the necessary corrections for error to the lowest possible limits. It is admitted that the corrections for rate of consumption of gas and of candles, and for variations in temperature and in barometrical pressure, are purely arbitrary and empirical; and therefore, where it is impracticable to reduce them to an insignificant quantity, they are curtailed in every possible way. As soon as the necessity for care in this direction was recognized and put into practice, the limits of error as between one operator and another—formerly so flagrant as to bring discredit on the whole system—were reduced within practical bounds; and the days when the gas company made the quality 20 candles, and the gas examiner brought it out as 14 candles, have long passed away. The portable photometer system not only returns to these conditions, but goes a long step farther back, and promises a last state of things that will be worse than the first. Its use must, among other matters, entail considerable corrections for temperature; and probably this has something to do with the variations in results above noted, as it may be employed in and out of doors.

But what would be the practical outcome of the adoption of the system? As soon as the novelty of the thing had passed away, the customers would get tired of giving the use of their living or business apartments for the purpose of a temporary testing-place. Unless actuated by such motives as above indicated, they have very little interest in the question. So the gas examiner would find himself and his outfit practically put out on the streets, and called upon to take snap-shots at the street-lamps. Here he would encounter difficulties due to weather and to exigencies of traffic. As in the case of indoor tests, after the novelty had passed away, his paraphenalia would be regarded as a nuisance. He could not work under the gloom of a London fog, or while exposed to heavy rain, snow, or wind. Gradually he would gravitate down to a few sheltered localities—such as the ends of blind-alleys—where he could pursue his investigations undisturbed by rumbling vehicles or jostling passengers, and be partially at any rate protected from the severity of the weather.

Under such circumstances, there is no guarantee whatever or provision for securing a fair sample by flushing out the service and other pipes between the bulk of the supply and the apparatus; nor would it always be possible to do so. There should be no misunderstanding on this point. Coal gas is not an unstable compound that commences to deteriorate as soon as it leaves the works. In earlier days, when the importance of slow and gradual condensation was not thoroughly understood, it is quite possible that it may have lost a candle or two while travelling a few miles. But, as produced under modern conditions of condensation and purification, it is a fairly hardy article, not affected by ordinary conditions of supply. The bulk of the consumers get as good value as those living close to the gas-works; and the supply to the official testing-rooms is a fair sample of the whole. Yet it is quite possible that certain portions, representing an insignificant percentage of the whole supply, are subjected to particularly unfavourable circumstances. There may be such a thing as a half mile length of 3-inch pipe, originally laid for the supply of a large consumer, but now only utilized for a few lamps. Railway companies often lay several hundred yards of pipe on their own premises, for the supply of distant signal-boxes. These pipes may, at particular points, be more or less exposed to the weather. A sample of gas drawn from the extreme end may have entered at the other perhaps 24, perhaps 30, hours previously, during which time it has been subject to the operations of exosmose and endosmose, to variations of temperature, and to the solvent action of hydrocarbons previously accumulated on the interior surface of the pipe.

If no other method than the portable photometer was available, some of these disadvantages could be minimized by restrictions limiting the length of service between a sufficiently representative main in regular use—say, not less than 8 inches in diameter—and the testing apparatus, and for securing a proper flush-out of the whole before testing. Maximum and minimum limits for pressure and temperature could be set, on the lines of those adopted for the sperm candle. But at best, the portable system would introduce a state of things far less satisfactory than the earliest attempts at a photometer room; and gas companies cannot regard it in any other attitude than that of uncompromising opposition, as contrary to the spirit of the Adulteration Acts, and as leaving no possible security for safety against conviction.

Some Deep Borings for Water.—In the "JOURNAL" last week we published particulars of the deep boring for water which the Lincoln Corporation are about to undertake, under the advice of their Consulting Engineer, Mr. Percy Griffith, Assoc.M.Inst. C.E., of Westminster. As the proposed boring is of unusual depth, it may be of interest to give the following measurements of others, which appeared in a popular weekly illustrated periodical on the 3rd inst.: The well at Sperenberg, near Berlin, is 4190 feet deep; that at Pesth, 3182 feet; that at La Chapelle, Paris, 2950 feet; that at Neusalwark, near Minden, 2000 feet; that at Passy, Paris, 2000 feet; that at Grenelle, Paris, 1798 feet; that at Kissinberg, Bavaria, 1787 feet. The foregoing particulars were reproduced in the "Lincolnshire Chronicle" in conjunction with the following, furnished by a correspondent. The Cambridge Downs borehole is 542 feet deep, and furnishes 700,000 gallons per day. The Charleville borehole, 1371 feet deep, gives 3,000,000 gallons per day, with a pressure of 104 lbs. The Engonia borehole is 1666 feet deep, and produces 320,000 gallons per day. The Claverton Downs, at 1777 feet deep, sends up no less than 1,500,000 gallons per day, with a pressure of 167 lbs. The Thurlagoona bore is 6 inches in diameter and 1710 feet deep, and produces 3,000,000 gallons per day. The deepest completed borehole in the world is at Schadebach, in Prussia; it being nearly one mile deep.

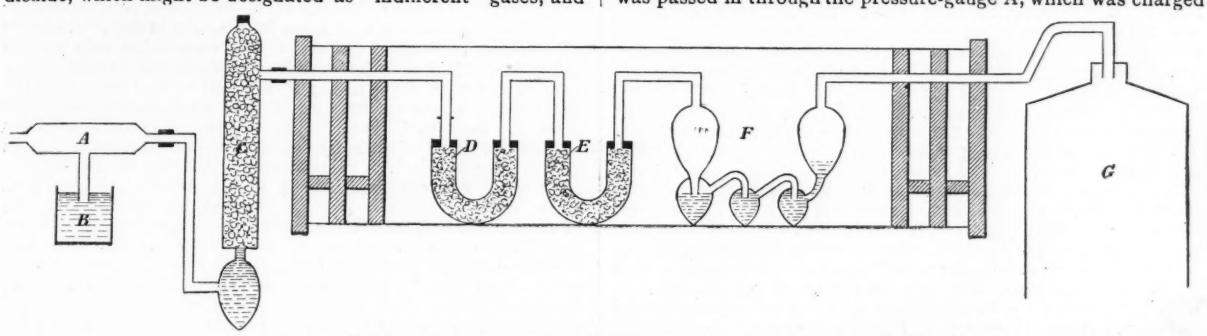
TECHNICAL RECORD.

THE PRESENCE OF NAPHTHALENE IN COAL GAS: A NOVEL THEORY.

At the Meeting of the London Section of the Society of Chemical Industry on Monday evening last week—Mr. BOVERTON REDWOOD in the chair—a paper was read by Mr. R. W. ALLEN, M.A., on "The Presence of Naphthalene in Coal Gas." As the text of the paper is not available previous to its publication in the Society's own "Journal," we have prepared the following account of its contents from notes taken at the meeting.

In commencing his paper, Mr. Allen said the discussion as to the amount of naphthalene ordinarily present in coal gas, and the prevention of its deposition therefrom, having been somewhat revived of late, he thought the result of some experiments made by him in the laboratory of University College, Auckland, New Zealand, about eighteen months ago, might perhaps be of some interest. The most plausible explanation of the deposition of naphthalene in gas-pipes was based on the supposed saturation of the gas, and the consequent supersaturation when the temperature fell, and deposition of some of the naphthalene. In order to ascertain whether this was really the case, he first determined the amount of naphthalene required to saturate a given volume of such gases as air, hydrogen, and carbon dioxide, which might be designated as "indifferent" gases, and then ascertained the amount of naphthalene required to saturate the same volume of coal gas carefully purified from any naphthalene that it might already contain. In this manner one might ascertain whether the coal gas really differed from an indifferent gas, at the same temperature, as to the amount of naphthalene required to saturate it. If there was a difference, and if it was due to the presence of the lighter hydrocarbon vapours in the coal gas, then he thought the presence of the vapours of such powerful solvents of naphthalene as ether, carbon bisulphide, benzene, chloroform, and ethyl alcohol in air ought to emphasize the difference. If any difference could be detected, then comparing the amounts of naphthalene required to saturate equal volumes of air and coal gas at the same temperatures, the exact amount of that substance in the gas could be ascertained.

By two totally different methods, the author determined the amount of naphthalene, in grains, required to saturate 100 cubic feet of air, hydrogen, and carbon dioxide at temperatures varying from 32° to 212° Fahr. The methods employed were: The direct evaporation method, wherein a known volume of each gas was passed through U-tubes containing dry powdered naphthalene, and the amount of naphthalene carried over estimated by the loss of weight of the U-tubes. Secondly, by the determination of the vapour pressure by the barometrical method. The author, referring to a blackboard sketch of the apparatus employed in carrying out the experiments under the first method, said the gas—hydrogen, carbon dioxide, or air—was passed in through the pressure-gauge A, which was charged



[*Drawn from the Rough Blackboard Sketch of the Experimental Apparatus Employed.*]

with oil B in place of mercury, because oil, on account of its lower specific gravity, showed slight changes of pressure very much better. It was then passed through a tower C filled with pumice saturated with sulphuric acid. Then it was passed on to a zinc water-bath about 3 ft. 6 in. by 2 ft. 6 in. long, and 2 ft. broad, comprising a number of compartments designed to prevent any air-currents passing into the apparatus. The gas, already partially dried, passed over into a drying-tube packed with calcium chloride D. A sulphuric acid bulb F, following the naphthalene tube E, was inserted to absorb the bulk of the naphthalene carried over at the higher temperatures, so that it might not clog up the exit-pipes. From the sulphuric acid bulb the gas passed into the aspirator G. The volume in the aspirator being carefully determined, and the temperature—viz., that of the air—and the pressure being known, the corrected volume of the gas in the aspirator represented the volume that had passed over the naphthalene. By weighing the naphthalene tube before and after the experiments, the amount of naphthalene carried over was easily found.

The duration of the experiments varied very greatly. The shortest ones lasted only 1¼ hours. Those were with hydrogen. The longest ones were 135 hours; and they were with air. The volume of gas passed over was only 1·27 cubic feet; so that the rate, even in the fastest experiment, was only 1 cubic foot per hour. A rather remarkable agreement might be observed between the various values. The rate at which the hydrogen seemed to saturate itself was exactly the same as that at which the much heavier air or coal gas saturated itself, and at corresponding times the weights carried over were practically identical. The difference between experiments of 1½ hours' and 135 hours' duration amounted to only (in that particular case the temperature was over 86° Fahr.) 7 per cent. The close approximation of the values at (say) 24 hours and 110 hours, showed that the gas at 24 hours was practically saturated.

The foregoing, the author said, was briefly the method employed for determining directly the amount of naphthalene that was required to saturate 1·27 cubic feet of gas; and Table II. contained the results (calculated, and checked from curves) as to the amount of naphthalene required to saturate 100 cubic feet of gas at temperatures varying between 32° and 212° Fahr. The author here called special attention to the close correspondence there was between the weight of naphthalene required to saturate 100 cubic feet of gas at 59° Fahr.—viz., 19 grains—and the weight extracted by Dr. Bueb by his washing process from the same volume of coal gas—viz., 20 grains, at a temperature of 60° Fahr.

The author next determined the amount of naphthalene required to saturate the same volume of coal gas, carefully freed from any trace of naphthalene, at the same temperatures; and he obtained results identical with those for the indifferent gases. Hence it would appear, he said, that the vapours of the heavier hydrocarbons present in coal gas exerted no influence on the power of the gas for saturating itself with naphthalene. To confirm this, experiments were made with air containing the most powerful solvents of naphthalene—viz., ether, carbon bisulphide, benzene, chloroform, and ethyl alcohol. Quoting

TABLE I.

Temperature 86° *Fahr. Volume of Gas Employed* = 1·27 *cub. ft.*

Gas Employed.	Length of Experiments. Hours.	Weight of Naphthalene Carried over. Grain.
Air	2½	·4907
,,	3¼	·4923
,,	4	·4938
,,	7	·4969
,,	9½	·5000
,,	11	·5047
,,	17	·5092
,,	30	·5123
,,	39	·5170
,,	135	·5293
Hydrogen	1½	·4815
,,	4½	·4830
,,	6¾	·4861
,,	14	·5092
,,	24	·5200
,,	110	·5278
Coal gas	3	·4861
,,	6	·4938
,,	15	·4969
,,	20	·5015
,,	55	·5231

TABLE II.

Temp. Degrees Fahr.	Weight in Grains of Naphthalene Saturating 100 c. ft. of Gas.	Temp. Degrees Fahr.	Weight in Grains of Naphthalene Saturating 100 c. ft. of Gas.
32 ..	6·0	131 ..	317·0
41 ..	9·8	140 ..	482·0
50 ..	14·1	149 ..	723·0
59 ..	19·0	158 ..	1050·0
68 ..	24·6	167 ..	1430·0
77 ..	30·9	176 ..	1898·0
86 ..	39·5	185 ..	2426·0
95 ..	57·5	194 ..	3035·0
104 ..	83·5	203 ..	3727·0
113 ..	132·0	212 ..	4420·0
122 ..	208·0		

from a table giving the values, at 140° Fahr., obtained from various gases, he said that 1·27 cubic feet of air, at 140° Fahr., carried over 537 grains, the same volume of hydrogen 537 grains, of coal gas 538 grains, of acetylene 538 grains, of marsh gas 536 grains; of air saturated, at 60° Fahr., with the following vapours—viz., of ether 548 grains, of carbon bisulphide 537 grains, of chloroform 542 grains, of benzene 547 grains, of ethyl alcohol 549 grains. From this it would appear that the presence of solvent vapours in quantities insufficient to saturate the gas exerted no influence on the amount of naphthalene vapour the gas could hold in diffusion.

The gas was next saturated at the temperature of 140° with the vapours of benzene and petroleum oils. So great was the increase in the amount of naphthalene carried over that the cooler parts of the apparatus almost immediately blocked up, the naphthalene in the U-tube completely liquefied, and the experiment stopped. Having thus established the fact that the coal gas could not, unless saturated with solvent vapour, hold in diffusion more than the same volume of naphthalene, and having found the gas employed was not saturated with benzene or petroleum vapours, it was clear that the amount of naphthalene present in the gas could be determined by observing how much additional naphthalene was required to saturate it. To diminish the errors as far as possible, the amount of naphthalene required to saturate the same volumes of gas from which all traces of naphthalene had been first removed, was also simultaneously determined. The temperature of the experiment was 130° Fahr.; and a sample of ordinary coal gas was used, carefully dried in calcium chloride tubes. The sulphuric acid tower was removed when using coal gas, so that the sulphuric acid should not act on the hydrocarbons, and remove them from the gas. The weight carried over by 1·27 cubic feet, the temperature being 130° Fahr., was 153 grains. When the gas had been carefully purified from all naphthalene by passage through tubes immersed in freezing mixtures, the weight carried over was 152 grains. When the gas was not only passed through the freezing mixtures, but through the drying-tower, and then through two bulbs of sulphuric acid at the temperature of the bath, the weight carried over was still 152 grains. From this it would appear that the coal gas which was supposed to be very nearly saturated with naphthalene, and which actually did form bad deposits, in reality contained none of the vapour of that body. This was confirmed by a long series of experiments. A little air saturated with naphthalene at the atmospheric temperature, by passage through a U-tube in a freezing mixture of ice and salt, deposited out practically the whole of the naphthalene at this temperature. In this way the small quantity of naphthalene could be detected. A considerable volume of coal gas was next similarly treated; but no trace of naphthalene was to be seen in the U-tube—only benzene and oily substances. This he took at the time to be conclusive proof that the gas itself contained no naphthalene. In truth, it did not clear up this; it only showed the possible amount of naphthalene was very small.

Subsequently Professor Brown experimented with large volumes of gas on the gas-works; but whether he did this before it entered the mains, or shortly after, he (Mr. Allen) was unable to say. At all events, he was unable to detect anything but a limited trace of naphthalene present; and yet the trouble from deposits was very great indeed. The truth of these observations had since been confirmed by passing the coal gas through a series of U-tubes, immersed in the freezing mixture of ice and salt, treating the frozen out product with a mixture of nitric and acetic acids, evaporating off any excess of acid and much of the nitro-benzene that was formed simultaneously with any nitro-naphthalene, and converting any naphthalene present into nitro-phthalic acid by means of an oxidizing mixture of potassium bichromate and sulphuric acid. No naphthalene could thus be found, although a small amount of the vapour of that body if introduced into the gas could be readily detected in this way. The experiments extended over a period of ten months, during which time the coal gas, proved to be free from naphthalene as it left the pipes, was continually forming deposits in the services. It would thus appear that they had this anomaly—that coal gas free from naphthalene would form deposits of that body in its passage through the pipes. The only possible explanation seemed to be that, under certain conditions, naphthalene was formed in the pipes themselves, and continued to deposit itself there. That this was always the case when naphthalene deposits were formed, the author did not wish to assert. However, it would satisfactorily account for the formation of deposits from gas containing less naphthalene than was sufficient to saturate it at any such temperature as it was likely to be subjected to in the pipes. The usual explanation "fall of temperature" would hardly suffice; for an ordinary sample of gas saturated with naphthalene at 60° would form no deposit of the solid if cooled to 50°. He had repeatedly tried this, and had found that, even on cooling the gas to — 20° Fahr., no deposits were formed.

The question arose as to the way in which this was brought about. Was there some unstable substance present in the gas, or formed under certain conditions in the pipes, which, under new conditions, spontaneously decomposed or combined with the hydrocarbons to form naphthalene? This question he was unable at present to answer definitely. His belief was that such an unstable body was already present in the gas, or was formed by the gas as it traversed the mains, and, under suitable conditions, combined with the hydrocarbons in the gas to form naphthalene.

In summarizing his conclusions, the author called attention to these points: (1) The very small amount of naphthalene required to saturate a given volume of gas at ordinary temperatures. (2) The fact that the presence of benzene or hydrocarbon vapours in quantities insufficient to saturate the gas did not affect the amount of naphthalene that a given volume of gas could hold in diffusion. (3) The easy detection of naphthalene by the formation of nitro-phthalic acid. (4) That gas which contained little or no naphthalene as it left the gasholders would, under certain conditions, form deposits in the distribution pipes. (5) Consequently, the necessity arose of looking elsewhere than to changes of temperature for an explanation of the formation of deposits.

Discussion.

Dr. F. Clowes, called upon by the Chairman, said he was glad he had been asked to say a few words, because he was responsible in the first place for the paper being brought before the Section; he was the first to suggest to the Committee that Mr. Allen should be allowed to bring it before them. He must say that it was a paper of a somewhat startling character. Gentlemen present would feel that in some sense a mine had been sprung among them. They had all held—and perhaps they could hardly give any reason for holding—that naphthalene was carried over by coal gas in larger quantity than it would be by any of the simple gases. Now Mr. Allen had given them figures which he (Dr. Clowes) thought incontestably proved that their notions on the subject had little foundation in fact. He could not see how they could get out of the conclusion that air and hydrogen carried over the vapour of naphthalene at least to the same extent as coal gas itself; and Mr. Allen had supported the experiments made by one method by experiments made by another. He (Dr. Clowes) might say that this work had been carried out by a young chemist of the greatest care and integrity; and those present who remembered Professor F. D. Brown's work when he was in England would know that any work done in his laboratory, even if not conducted by the Professor himself, would be certain to be performed with the greatest possible carefulness of manipulation. He knew that Professor Brown had had oversight of this work, and had in some sense mixed himself up with it; and work with which he had identified himself was work about which they could not question the scientific accuracy. Mr. Allen had certainly gone against all their prepossessions on this question. In regard to the latter part of the paper, they were assured that in some experiments on coal gas naphthalene had not been present, or its presence had never been detected in any quantity, but that from the gas naphthalene had been afterwards deposited. Here they had a "facer;" and he did not know what to say about it. He had made no experiments; but he could not doubt the experiments which Mr. Allen had brought before them. He thought some of the gentlemen present would be itching to repeat Mr. Allen's work; and repeating it with equal care, they would possibly find that they arrived at similar conclusions. But he (Dr. Clowes) could not help feeling that Mr. Allen had shown, as far as his work had gone, that naphthalene must, under certain conditions, be formed in gas in which it did not pre-exist. He himself had only had limited experience; and he should like to know what those conditions were. It would be interesting to learn what were the substances from which the naphthalene had been formed (they must assume) by chemical condensation. He sincerely hoped that Mr. Allen, who had shown himself to be an adept experimentalist, would be induced, by the reception of the paper that night, to continue his experimental work. Mr. Allen could not feel that he had finished his work; and if they could induce him to continue it, and bring the subject as to the formation of the naphthalene again before the Society, he (Dr. Clowes) would feel that what he did in recommending the paper to the consideration of the Committee had not been thrown away. There was food for contemplation of the most varied character in the paper.

Mr. T. S. Lacey (of the Pimlico station of the Gaslight and Coke Company) said it seemed to him that the chief interest in the paper to gas manufacturers was that it appeared, so far as he could see, to give them a method of estimating the amount of naphthalene in coal gas. The question of naphthalene deposits was, as they all knew, a very difficult one; and the first thing they required, before they could form any opinion as to the causes of the deposits, was that they should be able to measure the amount of naphthalene in the gas. It was certainly more important for them to be able to estimate these substances before forming an opinion as to the causes of the deposits than to simply make a guess as to what was going on. There was one circumstance that differed slightly from these experiments, and that was the presence of water vapour. He did not know, but he thought it quite possible that the effect of water vapour on the gas might considerably alter its behaviour in relation to the deposition of naphthalene. He fancied these experiments had all been made with dry gas. They did know this, that, when gas was passed through a wet meter containing a large quantity of water, it very frequently occurred that deposits of naphthalene were found immediately after the gas had passed through that vessel. This certainly would go to show that saturation of the gases with water vapour

had some effect in causing a very rapid deposit of the naphthalene. From this, one might be inclined to judge that the experiments made on dry gas might not be a direct guide to what might occur with a gas containing water vapour. However, another method had been shown them for estimating naphthalene. Possibly others might pursue these investigations; and then they would be able to arrive at, if not the solution of the problem, some information that would possibly set them on the right path.

Mr. J. W. HELPS (Croydon) said it was difficult to discuss a somewhat scientific paper such as the one Mr. Allen had submitted without having first had the opportunity of reading it; and therefore the remarks he had to make would only be on general principles. As Dr. Clowes had observed, Mr. Allen had given them a "facer." The theory which he had brought before them was one which he (Mr. Helps) must say did not coincide with the general ideas of gas engineers, nor did it coincide with the facts that their experience from day to day presented to them. They had been brought up in the idea that coal gas, being exposed throughout the works to deposits of naphthalene, left the works saturated. He was inclined to believe with Mr. William Young, who had done a great deal in investigating this matter, that the gas was saturated at the particular temperature at which it left the works. He should like to ask Mr. Allen one or two questions, and to inquire how his theory would coincide with two or three conditions and facts which he (Mr. Helps) had noticed in his own experience. He would take, for instance, the case of gas, say, at a temperature of 50° or 60° as it went into the holders on a hot summer's day—saturated with naphthalene at that particular temperature. In the holders, it was exposed to the hot sun; and the temperature was considerably raised. He was speaking now of a works where naphthalene was generally found both on the works and in the district; and the gas left the works at a higher temperature than it went into the holders. He found on that hot day that the naphthalene deposits were very much greater in the district than in the winter. If the gas did not pick up naphthalene at that particularly high temperature and drop it in the town afterwards, he should like to know where the naphthalene came from. He should like to mention another case. In two works almost side by side, and working under almost absolutely similar conditions (he referred to his own works at Croydon, which were very near those managed by his brother), the same coal was used, the same conditions of carbonization, and, with one exception, the same treatment after carbonization; and, notwithstanding, in his brother's town, naphthalene had never yet been seen, while in his own it was seen far too frequently. If this condition of affairs existed in the mains, and naphthalene was, as was assumed, synthetically built up in the mains, how was it that it was not built up in the town which he mentioned, while it was at Croydon? He agreed with Mr. Lacey, that, if Mr. Allen had not done anything else, he had shown them a method whereby they would be able to estimate the amount of naphthalene in coal gas; and until they could do this, they were working in the dark. Naphthalene was generally known as the gas managers' bugbear; and if Mr. Allen or some other chemist could only find out a means of ridding them of it, he would earn the thanks of the gas industry and profit himself. Gas managers had allowed this subject to slide in the most absurd way; and they were indebted to chemists for looking into the question for them. They did hope that Mr. Allen and others who might follow would go carefully into the matter, and give the gas industry the benefit of their researches, and try to rid gas managers of this bugbear which troubled them day and night, summer and winter.

Mr. WATSON SMITH (London) asked whether Mr. Allen had made an examination, under the conditions described, in connection with gas as it was produced, and also of the coal tar deposited previous to obtaining the gas. In several cases he (Mr. Watson Smith) had examined both; and he had been perfectly conversant with the condition of the gas. When the gas had been highly charged with naphthalene, he had always found the coal tar deposited—that was, previous to the gas entering the mains—had also been rich in naphthalene too. He also happened to know that gas manufacturers who used Wigan cannel coal, if they dared to use it exclusively, would obtain a gas which was free of naphthalene and would give little or no trouble, and the coal tar also would be free from naphthalene, but that the tar would contain anthracene in such a condition that it would be of no use to the alizarin manufacturer. They had therefore to manipulate their coal mixtures. There was no doubt some relation between the character of the coal and the products subsequently produced in the tar and the gas.

Mr. HELPS asked to be allowed to offer a slight explanation. In comparing the two works, he stated that the mode of treatment after carbonization was similar in either case. He should have said that, in the one where no naphthalene was found, the gas and tar passed away together; and this would make it appear that the naphthalene which existed in the gas was washed out by the tar, and so did not appear in the district.

Mr. WATSON SMITH said he should also like to know how the author managed to completely free his coal gas from naphthalene without the benzene vapours being also removed. He understood that Mr. Allen took a quantity of coal gas and completely freed it from naphthalene. How was that done without the benzene vapours being removed? If the benzene vapours were absent, he should not consider it a proper coal gas. It would scarcely be of an illuminating charater.

Mr. W. J. A. BUTTERFIELD said he had little to add to what Mr. Lacey and Mr. Helps had said. He was very interested and gratified to see that Mr. Allen had shown experimentally that the quantity of naphthalene taken up by all gases—at least, by air, hydrogen, and coal gas, was identical, as he thought statements had been very common to the effect that coal gas in containing large quantities of vapours of other hydrocarbons, could not therefore retain naphthalene to the saturating limit. One point he was not quite clear about, and perhaps Mr. Allen could give him some information. It was as to the point in the distributing system, or on the works, from which he took the gas in which he found there was no naphthalene. He noticed that Mr. Allen stated, in support of his figures as to the amount of naphthalene that gas could retain at various temperatures, that whereas he had found 19 grains per 100 cubic feet, at 59° Fahr., Dr. Bueb had, by the washing process, actually removed practically the same amount—20 grains he (Mr. Butterfield) thought it was—from coal gas on the works. He believed that the point where Dr. Bueb was working was immediately after the condensers; but he was not quite sure it was not after the scrubbers. It seemed to prove at any rate that at this point the coal gas was saturated with naphthalene, or something like saturated, at that temperature. Had Mr. Allen any idea where the naphthalene got out of the gas when he found it at some other point free from naphthalene? It seemed to him that getting a liquid condensation product from the gas by freezing, and saying that because it was free from naphthalene, the gas could not deposit it, would not apply to gas as it was distributed. To say that thereafter the gas could contain no naphthalene, and that therefore no deposition could take place in the mains, was going too far, because although, in the first instance, they got a liquid condensation product in which the naphthalene, if it was there at all, was dissolved, after a time they had gases passing over that were not fully saturated with the liquid hydrocarbons which had been deposited, and this gas carried off the condensed liquid, and, if it was already saturated with naphthalene, it left the naphthalene which had been dissolved in that liquid behind. Under different conditions of manufacture, it was quite conceivable that gas at one time was more nearly saturated with readily condensable liquid hydrocarbons such as benzene, and that at other times it was far more nearly saturated with naphthalene, and not so nearly saturated with liquids. Under these conditions, he thought it conceivable that the naphthalene might be left behind in certain parts of the mains where there was no liquid deposit at the same time to carry it into the syphons. One interesting point in regard to naphthalene in gas supplies was that he had heard it asserted that naphthalene deposits in mains considerably diminished the illuminating power of the gas. It was inconceivable that the small amount of naphthalene in the gas would make much difference to the illuminating power whether it were retained in it or not. At 59° Fahr., if the gas was saturated with naphthalene, it would probably make a difference of 0·15 candle. Well, if the gas passed through mains containing a deposit of naphthalene, one would expect it to arrive at the burner saturated with naphthalene; but, on the other hand, gas engineers would tell them that gas which had passed through services containing a deposit of naphthalene had its illuminating power reduced by its passage through them. This was conceivable on the assumption that the naphthalene exerted a scrubbing action on the gas, and scrubbed from it some of the hydrocarbons that were readily condensed as liquids—such as benzene—and thus reduced the illuminating power. He might say that he attempted only that afternoon, on seeing the subject of the paper, to ascertain what the effect on ordinary London gas would be of passing it over naphthalene, and thus making sure that it was saturated with it; his object being to see whether there was any definite scrubbing action, or whether the gas had its illuminating power increased by taking up naphthalene. He was working on the ordinary gas supply to his office; and he was sorry to say the Gas Company for some reason (he was working for about three hours) varied the illuminating power of the gas by 1¼ candles. This upset all his comparisons. The illuminating power varied when the gas was not passing through any material. He was passing the gas through naphthalene, intending to observe if the illuminating power was affected thereby; then omitting the naphthalene-tube, and passing the gas through a tube packed with sawdust to see whether there was any scrubbing effect due simply to passage through finely divided material. But the variation in the illuminating power of the gas at the time quite upset his experiments. But he might say that he thought it just possible there was a slight increase due to the naphthalene; and certainly the sawdust caused no increase, but perhaps a slight decrease. The experiments, however, were quite inconclusive, and needed to be resumed under more favourable conditions.

Dr. OTTO HEHNER said that, while listening to Mr. Allen's paper and to the experiments on which Dr. Clowes had passed such high encomiums, it seemed to him there was little connection between the author's careful experiments showing the saturation of gas by naphthalene at different temperatures and the fact that naphthalene was deposited in pipes from gas in which there was originally no naphthalene. He should have thought this curious point required some judicial inquiry; but he could not see that there had been any efforts in that direction to

ascertain whether any naphthalene really was deposited. He assumed that it was on hearsay evidence that the author made the statement that pipes were blocked up with naphthalene from gas which had not contained any, as all the time he was busy in his laboratory carrying out investigations intrinsically and scientifically interesting, but which were not altogether conformable with ordinary practice. Not a scintilla of evidence had been brought before the Society to show that the gas did deposit naphthalene while it contained none. The question as to the solubility of naphthalene had received the most able attention of Mr. Allen; but regarding what actually took place in gas-pipes underground they knew nothing. Mr. Allen had constructed a theory which, if ingenious, did require a little proof; and he (Dr. Hehner) had very grave doubts about it. Again, he did not think there was anything very astonishing that naphthalene dissolved in air, hydrogen, and coal gas in the same ratio. He endorsed what had been said as to the high manipulative skill which Mr. Allen had shown in his experiments; and he admitted that he had brought before them a very simple and pretty means of ascertaining whether there was naphthalene in gas. But another method of determining naphthalene in coal gas had quite lately been brought before another Section of the Society by Dr. Colman; * and it seemed to him, with great respect to Mr. Allen, that it was a better idea to make a definite compound of the naphthalene direct with picric acid, and then determine it, than to arbitrarily freeze the volatile substances, and then determine it. Whether a short passing of gas saturated with substances like naphthalene through a freezing mixture was sufficient to deposit it all, might be open to some doubt. Probably, however, Mr. Allen had given attention to this point. When one made experiments of this kind, dealing with extremely small quantities, a very precise method of determination was required. In 100 cubic feet of gas, at 32° Fahr., the author showed there were 6 grains of naphthalene; so that, when he worked with 1 cubic foot—and that took a precious long time—he would only get, at 32°, $\frac{1}{100}$ of the 6 grains (which was a small quantity to weigh with precision). However, he valued the experiments of Mr. Allen, and he appreciated the great care and accuracy he had bestowed upon his work; but he (Dr. Hehner) did think he had hardly given sufficient foundation for the revolutionary theory he had propounded.

Mr. R. Forbes Carpenter pointed out that Mr. J. P. Leather, of Burnley, had had some experience of washing gas with oil for the removal of naphthalene;† and if anyone could contribute any real knowledge as to what Mr. Leather had done, it would be interesting. He should like to know whether since Mr. Leather had had his method in use, he had experienced deposits in any new main? Mr. Helps had indicated how in summer time, and not only in winter, gas managers were troubled with naphthalene. He himself had also been told by gas managers that the trouble occurred not only in winter but in summer; and he could quite understand how, with a change in the temperature, a previous deposit of naphthalene might be moved, so as to choke up some local service. [A letter from Mr. Carpenter supplementing his remarks at the meeting will be found in our "Correspondence" columns.]

Mr. H. Leicester Greville said it was universally known that naphthalene was a special bugbear to gas companies. It had a peculiar tendency to accumulate in bends and angles of pipes—a fact probably largely due to friction. He believed that moisture had much influence on the formation of naphthalene deposits. With regard to the paper, it would require much corroboration before it could be accepted as a fact that gas normally left the works free from naphthalene vapour, considering that the presence of naphthalene in quantity was so evident at all points of the manufacture. That naphthalene—a substance always regarded as essentially a product of high temperature—could be absolutely produced in the gas at the ordinary temperature of the air would also require a large amount of confirmation. If naphthalene could possibly be permanently retained in the gas, instead of being deposited, it would be a great boon to gas companies, on the ground of its great value as an illuminant.

Mr. Allen, replying on the discussion, said he had dealt with his subject purely from the point of view of the scientist; his practical knowledge was absolutely *nil*. For the statement he made as to the deposition of naphthalene in gas-mains, he had the authority of his own Professor (who was the Chairman of Directors of the local Gas Company), and also that of the Chief Engineer of the works, who was continually at the University [Auckland, N.Z.] where he (Mr. Allen) performed the work. He should also like to point out that the work extended over a year; and this to a great extent eliminated any variations that might have otherwise existed in the amounts of naphthalene in the gas if he had only worked at the subject a few times, and with widely differing intervals, instead of working at it continuously for nearly ten months. Reference had been made to Mr. Leather; and he (Mr. Allen) was very nearly quoting him in support of some of his statements. In the "Journal of Gas Lighting" for Sept. 26 last [p. 755], there was a reference to Mr. Leather's experience, which showed that, with gas containing an amount of naphthalene utterly insufficient to saturate it, he had trouble from deposits in the mains. In reply to Mr. Watson Smith's question, as to how he prevented the benzene being removed from the gas along with the naphthalene, he made no effort to prevent the benzene being removed. He wished it removed in fact; but, on the other hand, he experimented afterwards with gas from which the naphthalene had been carefully removed and carefully dried, and the benzene was reintroduced, but in quantity insufficient to saturate it at the temperature of the bath. Dr. Hehner asked why he did not convert the naphthalene into a picrate. He did not convert it into a picrate of naphthalene because the benzene at the same time would have been converted into a picrate, and would have formed a solid; whereas, by first converting it into nitro-benzene and nitro-naphthalene, and then oxidizing it with chromic acid, nitro-phthalic acid was alone formed. There was certainly no such compound of benzene formed. He therefore thought that it was much better to form nitro-phthalic acid and effectively get rid of the benzene. Dr. Hehner also remarked upon the fact that he had worked on small quantities of air. He did; but he (Mr. Allen) had the utmost confidence that his weighings were correct in every instance to (say) the 50th of a milligramme. Dr. Hehner also had no doubt that the weight of naphthalene required to saturate hydrogen, coal gas, carbon dioxide, &c., was exactly the same. Without wishing to disparage his opinion, he (Mr. Allen) might say that Professor Brown had very grave doubts whether coal gas or carbonic acid would load itself up with naphthalene at the same rate as the lighter hydrogen would load itself up. With regard to Mr. Helps's question, he was sorry he could throw no light upon it, as he (Mr. Allen) was not a practical man. But it seemed to him that Mr. Helps's statement that a hot summer's day had some effect on the gas, rather supported his own view. A hot summer's day was just the day when the benzene was not going to condense out—when it was not going to prevent the deposition of naphthalene at all by solution. But still, as he had said, he bowed to their opinion, being himself utterly unpractical and scientific only. Reference had also been made to the way abrupt bends seemed to facilitate the deposition of naphthalene. He had tried to imitate this in a great number of ways; but he did not succeed at all. He had electrified the gas, treating it with high alternating currents, but could not imitate the deposition in any way.

The Chairman remarked that the subject they had been discussing was of the highest importance to gas manufacturers; and it only remained for him, as Chairman, to tender to Mr. Allen the thanks of the meeting, and to endorse the suggestion which Dr. Clowes had made that the author would follow up his investigations, and place before the Society, on a future occasion, some experimental proof of the rather revolutionary view of the genesis of naphthalene in coal gas which they had had submitted to them.

* See *ante*, pp. 330, 405. † See "Journal," Vol. LXXIII., p. 1734.

PUMPING GAS FIVE MILES AT 20 LBS. PRESSURE.

By F. H. Shelton, of Philadelphia, U.S.A.

[A Paper read before the New England Association of Gas Engineers, at the Thirtieth Annual Meeting, Feb. 21, 1900.]

Last June, I read a paper before the Western Gas Association, at their twenty-second annual meeting, in Milwaukee, entitled and advocating "Distributing Gas under High Pressure."* I pointed out that steam, ammonia, air, oil, water, Pintsch gas, natural gas, and other fluids are daily safely distributed and handled in public places at many pounds pressure, in contrast with illuminating gas at but a few inches pressure (or but the fraction of one pound); and that the traditional practice of using but a zephyr-like pressure, involving large and costly pipes to send gas some distance, is relatively wasteful of energy and expensive, and, when analyzed, but little short of ridiculous. I contended that mechanical appliances, as well as precedents, were now sufficient to warrant distributing illuminating gas at several pounds pressure; and that such a plan of working should be, and could be, made to be entirely satisfactory, and would save enormously in the investment required. Since reading that paper, considerable further thought upon the matter has brought the settled conviction that transferring or distributing artificial gas at high pressure involves neither any great experiment nor any particular risk. An opportunity a short time ago presenting itself to demonstrate my belief, despite the solicitous concern of several pessimistic friends, I assumed the responsibility of constructing a high-pressure system. It has worked perfectly satisfactorily from the start. I have the pleasure of describing it herewith.

Phœnixville, Pennsylvania, 28 miles above Philadelphia, on the Schuylkill River, is a manufacturing town of 10,000 population. Spring City and Royersford, some 5 miles above it, are smaller towns adjoining, on opposite sides of the river, and together form a gas district of 6000 people. In the intervening distance between it and Phœnixville, there are a few farm houses, and a county almshouse about midway. Each district has had a Gas Company for many years. The plant at Phœnixville was fair; that at Royersford was wretched. The Consolidated Schuylkill Gas Company, organized by myself and associates, acquired, on Oct. 1, possession of both plants. It was decided to lay a high-pressure connecting main from

* See "Journal," Vol. LXXIV., p. 372.

Phœnixville to Royersford, shut down the plant at the latter point, and make all gas at Phœnixville. Work on the pipe-line was started on Oct. 27. Gas was pumped through within 64 days —on Dec. 29. Since that date, the Royersford district has continuously procured its gas from Phœnixville, without either trouble or the suggestion of trouble.

The connecting pipe-line is 23,015 feet—or about $4\frac{1}{3}$ miles—in length, 3-inch size, and, of course, of wrought iron. To protect against corrosion, it was suitably coated after being strung along the road, and recoated in part after joining in the trench. The pipe is heavier than the ordinary. Special threaded connecting sockets were used; and provision was made for protecting the threads in shipment from the pipe-mills to the ditch. It is bedded $3\frac{1}{2}$ to 4 feet deep in natural earth from end to end. Two thousand feet of the run was through rock, requiring blasting; 10,000 feet was through more or less shale and surface rock. Midway, it passes through an old-fashioned covered, three-span, wooden bridge, 600 feet long, crossing the Schuylkill River; being attached to the trusses 7 feet above the drive level. Certain weather casing was here provided. At one point, over a stone arch road bridge, the pipe has but 15 inches covering for a distance of 60 feet. It runs along a public highway throughout, excepting one stretch of 1200 feet through fields—private ground. In its run, it crosses under a three-track trunk-line railroad. Valves are inserted at intervals, and adjoining the bridge, for use in the event of freshet or fire affecting the latter, and to facilitate the locating of any possible future leaks. Drips are provided. The run is fairly hilly. Some provision was made for contraction and expansion. As each 1000 or 1500 feet of pipe were added, the line was tested throughout with air pressure, from a power compressor at the works, to 60 lbs. Despite all foresight and care, leaks were usually found. These were corrected, and a second test made; and until the line stayed tight for hours was final filling in of the ditch permitted. When the line was finished, it was bottle-tight, from end to end, as proved by a 60 lbs. test for hours. A wire was laid alongside in the trench from end to end, to enable the use in the future of any desired electric alarm, call bell, or recording or signalling apparatus. A number of other constructional details and adjuncts were incorporated, not necessary to here take up at length.

The pumping machinery at the starting point is a straight line, steam driven, air-compressor, of the usual type, but altered for handling gas. The steam and gas cylinders are each 8 in. by 12 in.; and the listed capacity, at 140 revolutions, or free air at atmospheric pressure is 5820 cubic feet per hour, with a duty of about 20 indicated horse power. The compressor draws gas at ordinary pressure from the holder; a station-meter with bye-pass intervening. It is located near the water-gas apparatus, and is attended to by the gas-maker. No extra labour is employed. The space occupied is about 2 ft. by 8 ft.; and its weight is slightly over 1 ton. Its cost, including governor, gauges, setting, freight, foundation, &c., was about $1000. It is so run as to maintain from 10 to 20 lbs. pressure on the pipe-line. Provision was made for adding a duplicate compressor. Gauges and other minor appurtenances were provided.

Principally because of quick delivery, two regulators or governors were used at the far end, to reduce the pressure from the pipe-line to the customary 2 or 3 inches. The first, with 3-inch connections, is built to reduce from 50 to 2 lbs. The second, with 6-inch connections, from 2 lbs. to 2 inches. They are of the dry, non-freezing diaphragm type. They are relatively inexpensive, and seemingly perfect in action. The gas, after being reduced in pressure at the gas premises in Royersford, goes into a gasholder of 10,000 cubic feet capacity, from whence it passes into the street-mains in the usual fashion. Connections are made, however, so as to enable bye-passing the holder, and the throwing of the governors directly on the town. The low-pressure 6-inch connections are sufficient for the present; but 8-inch will be a later size, and are partly in place. Suitable gauges, safety appliances, and other features are covered in the valve-room at the terminus of the line. The equipment within the room represents a cost of about $500. Taking this figure, and the cost of a compressor, as about the sum already stated, *plus* the outlay on any given size pipe-line laid per mile, one can approximate the cost of a complete high-pressure installation.

As to operation. The gas handled is a straight illuminating water gas of from 20 to 22 candle power, made from naphtha on a machine of the Lowe type, but of bad design. The single superheater is smaller in diameter than the generator, and the fixing surface scant. This will ultimately be corrected; but observations so far have been upon gas made on the machine as above. Each morning the gas-maker at Phœnixville runs the compressor for about two hours, and pumps enough gas up the valley to fill the holder at the Royersford works. Pumping then ceases; and the Royersford and Spring City supply is maintained from the local holder. About 5 o'clock, it is nearly emptied; and pumping is resumed, and continued until perhaps 8 o'clock, when the holder is left full for the night. Royersford signals Phœnixville when to start and when to stop pumping. The compressor is run at a rate 25 per cent. less than its listed speed, and handles thus in practice about 4000 feet per hour, which means a capacity of about 100,000 feet per day. This is at relatively low pressure. By increasing the speed and pressure, and the alteration of governor adjustments, the pipe-line can deliver much more in the future, when necessary. While pumping, there is a loss of 2 to 3 lbs. pressure at the far end, due to friction. Between periods of pumping, the pressure equalizes, and is left on the pipe-line; and in eight to twelve hours over night it drops from 1 to 3 lbs. This is not pipe-line leakage, but is due to the consumption of customers so far taken off the line, changes in temperature, slight condensation, difference in gauges, leakage around valve-stems, &c. The cubic capacity of the line is about 1200 feet.

The sceptics as to the success of the plan of handling, as herein described, illuminating gas at 20 lbs. pressure, told me there would be considerable loss of candle power from the compression; that the governors would not be reliable; that condensation would trouble us; that the high pressure in the pipe would be dangerous; that corrosion and leakage would shortly follow; and that breakdowns of the pumping machinery would imperil the general supply. We have been working now for nearly two months; and we do not find the trouble predicted. There is no visible difference in the candle power because of the compression and long-distance delivery. The regulators have not misbehaved a particle. We find them to be entirely reliable and dependable. The condensation is slight, is mostly caught at the beginning, and involves no trouble to take care of. There are no signs of probable breakdowns. The compressor works as smoothly as could be desired. Duplicate parts in stock, at moderate cost, will enable the quick replacement of anything that is likely to break, as the holder at the far end gives at present a storage capacity sufficient to permit of changes, alterations, &c. When it is done away with, as is the expectation before long, a duplicate compressor will first be added, which can be started up in thirty seconds, in the event of a breakdown of the one operating. We have no leakage on the pipe-line; and its construction is such that we are certain it will last for many years before any occurs, or repairs or renewals of moment prove necessary. We are satisfied with it; we have not aimed to satisfy others.

The following points may be noted in connection with the general operation. The amount of drip-liquor taken out daily at the compressor and at the first drip or two out on the line, is about 2 gallons, combustible and largely oil, but with some water in it. Drips examined half way along the line so far are practically dry. The amount of drip recovered is about 2 per cent. of the volume of the oil used in gas making. The temperature of the gas after compression and a couple of hours' operation, with 15 lbs. pressure in the pipe-line, was noted as 106°. At 20 lbs. pressure, it was 114°. The outside temperature was 40°. The temperature of the gas, after emerging from the earth and passing through the regulators, was from 54° to 58°. It will be noted that no tank or cushion chamber is used at the outlet of the compressor. There is some pulsation while pumping at the beginning of the line; but no customers exist at this point. Services along the pipe line, where expected, were provided for by tees. Additional services can, if desired, be put in without shutting off the gas.

In a second high-pressure line that will probably be installed shortly elsewhere, there will most likely be used—for the sake of compactness—a single governor, instead of two as on the line herein described, including increased provision for the occasional cleaning of same, as well as a line-meter that will measure gas at 50 lbs. pressure.

No photometrical observations have yet been made. We have been too busy with the completion of the line and other construction work to do aught else than get things finished and going in general. All of the figures mentioned in this paper are general, and those so far observed; but they are felt to be practically correct.

We have just added midway a branch run of 2000 feet of smaller high-pressure pipe, to the County Almshouse mentioned, with which we shall handle a business expected to amount to 500,000 cubic feet of gas a year. Two house-regulators at the far end of this run reduce the gas to the ordinary pressure, and control the supply in the buildings; while a third regulator at the entrance to the Almshouse grounds controls a single lamp-post. Each and all of these individual customers' service-regulators are working as well as the main-line regulators. They cost but a few dollars each, and show the ease with which business can be taken care of *en route* on a high-pressure line. A fire-house was also served by such a regulator for some few weeks; and seventeen houses on a cross street of 800 feet length are now being connected.

It will be noted that the work done by the above pipe-line and compressor is substantially the economical transfer of gas from one holder to another a few miles apart. The two months' operation has satisfactorily demonstrated to me that we can pump gas at high pressure long distances, dependably as to both pumping and regulating mechanism, without trouble as to condensation, at low operating cost, without visible loss of candle power, and on a very low investment outlay. I am expecting to further demonstrate that we can serve a town some miles distant with such an equipment, *and without the use of a holder*. The regulators have so far worked perfectly on varying supplies and pressures, in taking care of the gas passing through them into the holder; and there is no reason why they should not equally well handle and control the gas passing into the town direct. In fact, we have already so operated (tentatively, but continuously for two or three days) in preliminary trials, and entirely successfully, with the holder bye-passed and entirely shut off; and we are expecting shortly, by a lengthy trial, to fully prove the last point

to be covered—namely, that a high-pressure line, with continuous pumping at a moderate rate and duplicate compressors, will safely and dependably supply a town direct, and that no holder is necessary.

The long-distance, high-pressure delivery here described was started during a cold snap, and involved a plan of working entirely new to the men in charge. The gas was made with an indifferent machine, and was not over well fixed. The reconstruction of the works at large to some extent interfered with attention to, and concentration upon, the pumping department. No station-meters were then in use; and the steam supply for the entire works, water-gas making, heating, and all, depended upon but a 30-horse power boiler. Despite the above, everything worked as smoothly as could be desired; and that this should be so under such conditions is confirmation of my belief that pumping at high pressure can be readily done.

In view of the uniformly smooth working, and the satisfactory results experienced, there is no question in my mind that in most instances the cheapest way to transmit gas long distances will be found to be by several pounds pressure through a very carefully laid small screw-pipe. I and my associates are entirely satisfied with what we have done at Phœnixville on the lines described, and are expecting to shortly repeat it on a much larger scale in another, perhaps two other places.

While the pipe-line here described is the first of which I have knowledge anywhere in which ordinary 22-candle power illuminating gas is handled at 20 lbs. pressure, or thereabouts, it should be remembered that its successful working is but a confirmation of a closely similar operation that has for a long time been conducted by Mr. H. H. Edgerton, in Danbury, Conn., but which has practically been steadily overlooked or ignored by gas men at large. Mr. Edgerton, in pumping for nearly ten years a 35-candle power oil-water gas three miles through a 2-inch main, and up to 40 lbs. pressure, has long since shown the feasibility and low investment cost of supplying a town at a distance by high pressure. Credit for being the first to operate such a system should go to him.

The successful operation of a high-pressure line, I am well satisfied, will be closely dependent upon the attention paid to details. It may be thought that anyone can buy a pump, run a line of pipe, attach a regulator, and in this way deliver gas at a distance. Anyone can try it; but I am certain that, unless from twenty to thirty specific, definite details, of both construction and operation, are sufficiently foreseen and provided for, the result will be but partially satisfactory.

THE PRODUCTION OF LIQUOR AMMONIÆ FROM GAS LIQUOR.

Dr. Otto Pfeiffer, of Magdeburg, has recently published in the "Journal für Gasbeleuchtung" an account of improvements he has made in the process of manufacturing liquor ammoniæ direct from gas liquor. He claims that they have resulted in a considerable reduction in the cost of production. We propose to indicate briefly the outlines of Dr. Pfeiffer's recent work on the matter.

The old method of producing liquor ammoniæ from gas liquor consisted in heating the latter with sufficient lime to retain the acid radicles of both the fixed and the volatile ammonia. The amount of lime required was therefore very large—especially as the salts in the liquor are not wholly the normal compounds, but partially the acid salts. The large quantity of lime used produced incrustations on the liquor in the still, which adhered to the walls of the latter and proved troublesome. It was found that preliminary heating of the liquor removed a large proportion of the sulphuretted hydrogen and carbonic acid, leaving a quantity of free ammonia in the liquor. Actually, the free ammonia in liquor which has been thus subjected to a preliminary heating amounts to about two-thirds of the total ammonia; and consequently lime about equivalent to only the remaining third need be added when such liquor is worked up to liquor ammoniæ. The quantity of lime required is in practice deduced from the total amount of the acid radicles in the heated liquor, in the following manner: A given quantity of milk of lime, of known degree of alkalinity, is boiled with a given quantity of the heated gas liquor, until ammonia ceases to be evolved. The excess of lime remaining is then ascertained by titration with standard acid, using phenolphthalein as the indicator. The quantity of lime theoretically required is thus readily found; and a slight excess is added to the liquor in practical working. At the Magdeburg Gas-Works, the adoption of preliminary heating of the liquor, and the addition of the lime according to this rule, resulted in a saving of 50 to 60 per cent. of the lime which was used when the addition was made according to the amount of ammonia in the crude gas liquor. The method of working adopted was the following.

About 650 gallons of gas liquor was gradually heated in the still by indirect steam, to about 212° Fahr. This heating occupied two hours. The gases evolved consisted chiefly of carbonic acid and sulphuretted hydrogen, but also contained appreciable quantities of ammonia. In order to recover the latter, the gases were led into a vessel, in which they passed through crude gas liquor. At the conclusion of the preliminary heating, milk of lime containing the proper amount of lime was pumped into the still, and distillation was commenced by means of live steam. The gaseous ammonia which distilled off, accompanied by steam and small quantities of carbonic acid, sulphuretted hydrogen, and empyreumatic products, passed through a system of three washers or condensers charged with milk of lime, a reflux condenser, and four charcoal filters. This train of apparatus abstracted the steam and impurities; and the ammonia passed on to the absorption vessels, in which it was absorbed in distilled water kept at a low temperature. The distillation occupied about eight hours; and its conclusion was determined by the cessation of the noise of the bubbles of gas escaping under the water. The residual liquor in the still then contained only 0·03 per cent. of ammonia—*i.e.*, was of 0·14 "ounce" strength—and further treatment of it would have proved unremunerative.

The amount of lime used might be restricted to the quantity theoretically needed, and yet the whole of the ammonia (apart from the aforesaid residual 0·03 per cent.) could be recovered. But in this case distillation had to be continued for ten, instead of only eight, hours. When only the theoretical amount of lime was employed, the liquor after eight hours' distillation contained, on the average, 0·071 per cent. of ammonia; and after ten hours' distillation, the percentage dropped to 0·027. The additional two hours' distillation, therefore, produced an increased yield of ammonia equivalent to 8·2 lbs. of liquor ammoniæ, sp. gr. 0·890, per charge of 615 gallons of liquor put into the still. The cost of production of high-grade liquor ammoniæ, however, is about 10s. per cwt. This total comprises cost of lime 7½d., steam 4s. 6d., and wages 1s. 3d. So that clearly two hours' expenditure of steam and wages for the recovery of 8·2 lbs. of liquor ammoniæ cannot be remunerative, as the prime cost of this quantity is less than 9d. It would thus pay to stop the distillation at eight hours.

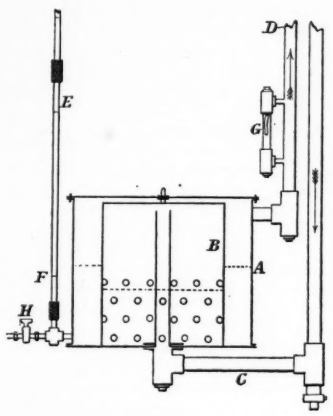
It was, however, far more economical to employ an excess of lime. Practically, it was found that, each time the still was recharged, about 44 lbs. more lime than the theoretically required quantity gave a satisfactory result. For instance, with eight hours' distillation, 132 lbs. of lime brought the ammonia in the gas liquor down to 0·07 per cent.; 165 lbs. of lime reduced it to 0·05 per cent.; while 176 lbs. of lime in all cases brought it below the normal residual percentage of 0·03. Even when only the theoretical amount of lime was employed, sulphuretted hydrogen was never found to pass forward to the absorption vessels. The reflux condenser retained traces of sulphuretted hydrogen, which escaped absorption by the milk of lime washers. If, however, there were some defect in the working of the plant, the use of only the theoretically needed amount of lime might have very serious ill results. For instance, the pipe leading the gases evolved during the preliminary heating process into the vessel containing gas liquor might have become choked by incrustations of ammonium carbonate, or the valve on the dip-pipe might not have opened at once.

In either instance, the acid gases would have been retained under pressure in the still, and the preliminary heating would not have sufficed to expel them. In such a case, undecomposed gas liquor would have distilled over if only the theoretical quantity of lime had been put in the still; and many hours would then be spent in cleansing by steam the whole train of apparatus contaminated by the sulphuretted hydrogen. The walls of the iron vessels would have suffered corrosion; and the liquor ammoniæ would for many days be discoloured by traces of iron. Such ill effects of faulty working of the plant could be entirely avoided by the interposition in the purifying system of a washer charged with a solution of caustic alkali. Two sets of apparatus at the Magdeburg Gas-Works have been provided with such washers for one-and-a-half years; and notwithstanding inadequate preliminary heating, or addition of too little lime to the still on several occasions, the liquor ammoniæ obtained suffered no contamination. The washer was placed between the charcoal filters and the absorption vessels; and consequently the gas was cool when it entered the washer. Soda lye, made by dissolving commercial caustic soda in ten times its weight of water, was the agent employed in these washers.

The washer at the Magdeburg Gas-Works was made by the Berlin-Anhalt Engineering Company. It consists (p. 679) of a cylindrical casing A of sheet iron, 0·2 inch thick, about 26 inches high, and 32 inches in diameter, closed at top and bottom. Within this cylinder is a cylindrical bell B, reaching nearly to its top, and attached by a bolt thereto. The diameter of the bell, which rests on the bottom of the outer casing, is about 22 inches. The lower half of the bell is perforated in rows of holes about 0·6 inch in diameter. The gaseous ammonia from the charcoal filters passes into the washer through a pipe C, which enters the bottom of the casing and extends to within a short distance of the top of the bell. The soda lye stands in the apparatus at a level about 1·6 inches above the topmost row of perforations in the bell. The gaseous ammonia, therefore, can only escape from the bell to the outer casing by depressing the level of the soda lye within the bell, and passing through the perforations and lye to the space between the bell and the casing. In the upper part of the wall of the casing, is the outlet-tube D by which the gaseous ammonia which has been washed by the soda lye passes on to the absorption vessels.

The dimensions of the parts of the washer are so co-ordinated that it throws very little back-pressure. The soda lye is run into the washer through a cock H in the lower part of the casing. A vertical glass tube E, communicating with the interior of the casing, shows the level of the lye within; and a mark F on the

tube serves to indicate the height to which the apparatus should be filled when it is recharged with lye. This tube is extended upwards for about 6 feet with ¼-inch gas-piping, open at the top, so that in the event of great back-pressure the gaseous ammonia will not pass back from the absorption vessels to the washers.



When the washer is filled with fresh soda lye, the latter absorbs much ammonia, and increases in volume. After saturation, the surplus liquid may be run off and kept for subsequent use. Or, in place of simple soda lye, the washer may be charged with equal volumes of soda lye and liquor ammoniæ. Very little increase of volume then ensues.

In regular working, the soda lye remains active for a long period—sometimes for a year. Its life is, of course, dependent on the number of times when the gas liquor is not subjected to an adequate preliminary heating. The soda lye, after it has been in use for a short time, should be tested at intervals for the purpose of ascertaining the amount of available caustic soda in it. Or, an even simpler means of finding out the exhaustion of the soda lye is to test the gaseous ammonia as it leaves the washer for traces of sulphuretted hydrogen, by means of lead papers, just as coal gas is tested for the same impurity. It is convenient to have a short glass tube, G, affixed to, and communicating at both ends with, the pipe by which the gaseous ammonia leaves the soda-washer. A strip of lead paper is suspended in this tube; and as a portion of the stream of gas passes through the tube, the lead paper becomes discoloured as soon as sulphuretted hydrogen begins to escape from the soda-washer. The lye must then be renewed. The spent lye is removed to the still, in order that the dissolved ammonia may be recovered.

For small works, the soda-washer affords a great advantage in that the smallest quantity of lime may be used in the distillation of the gas liquor, and expert chemical control of the working is rendered superfluous. For instance, starting with the ordinary allowance of about 330 lbs. of lime for each refilling of the still, the amount may be reduced in successive distillations by 20 to 40 lbs., until the completion of the distillation is observed to be retarded. From such trials, it is easy to deduce the smallest amount of lime which serves for working off the average charge; and thereafter that amount may be used without fear of faulty operation of the plant.

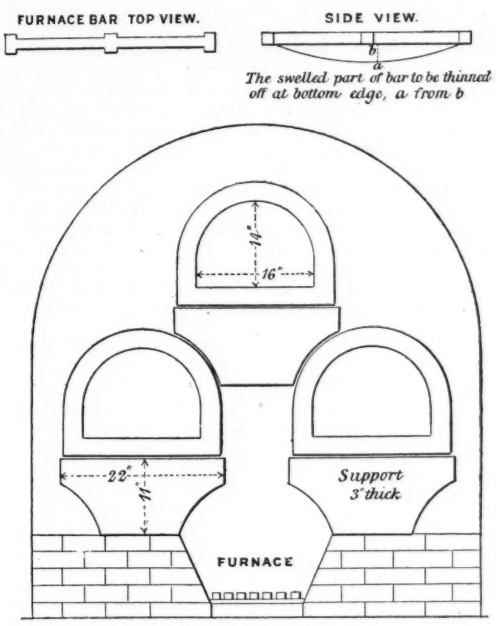
The advantages of the soda-washer in the manufacture of liquor ammoniæ are briefly—

1.—It enables the minimum amount of lime which may be employed to be found without analysis, and without causing contamination of the product with sulphuretted hydrogen.
2.—It avoids the necessity for frequently replenishing the hot washer in front of the still with lime.
3.—Irregularities in the preliminary heating of the liquor do not affect the liquor ammoniæ made.
4.—Such irregularities are discovered by the prolongation they cause of the period of distillation with a restricted use of lime; and hence they can rapidly be rectified.

Preventing Waste of Water.—We learn from the "Engineering Record" that the prevention of the waste of water has become a serious problem in Schenectady (N.Y.). The quantity of water pumped daily is 162·5 gallons per head; and if this continues, additional pumping plants will be required. This will necessarily entail the expenditure of a large sum of money; and the question before the inhabitants is whether they will submit to additional taxation or make an effort to stop the waste. Reporting upon this matter, Mr. G. T. Ingersoll says: "The use of water-meters for stopping the waste of water is at the present time receiving the attention of water-works managers the world over; and from information and data received from cities having them in use, there can be no doubt that they accomplish the desired results. I am well aware that to instal a meter system over the entire city means the expenditure of many thousand dollars; but I am satisfied it is the only practicable and satisfactory method to all parties to prevent water waste."

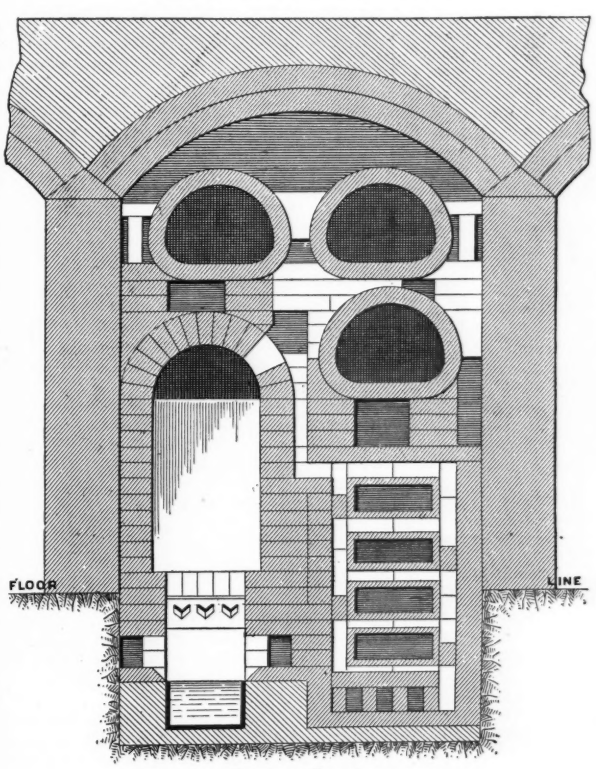
RETORT-SETTINGS IN 1850 AND 1900.

Mr. J. Armitage Drake (Messrs. Jonas Drake and Son), of Halifax, recently sent for publication a very interesting sketch, and the autograph letter by which it was accompanied, of a setting of three clay retorts suggested in the year 1850 by Mr. Crosthwaite, the then Gas Engineer at Carlisle, for erection at the Douglas (Isle of Man) Gas-Works. This, which was evidently one of the best settings of clay retorts in use at the time, forms a great contrast to a gaseous-fired setting of the present day. In order to bring out this contrast, Mr. Drake at the same time forwarded a drawing of his latest type of such retort-furnace; and the two are reproduced below, together with the letter of explanation by which Mr. Crosthwaite accompanied the sketch he sent to Mr. Corteen, of Douglas. This matter is referred to in an essay appearing to-day (see p. 669).



Scale ½ inch to a Foot.

CROSTHWAITE'S SYSTEM—1850.



DRAKE'S PATENT SYSTEM—1900.

Gas-Works, Carlisle, May 30, 1850.

Mr. R. CORTEEN, Douglas Gas-Works, Isle of Man.

Dear Sir,—In reply to yours of the 27th inst., I beg to hand you a rough elevational sketch of our oven and retorts, with the

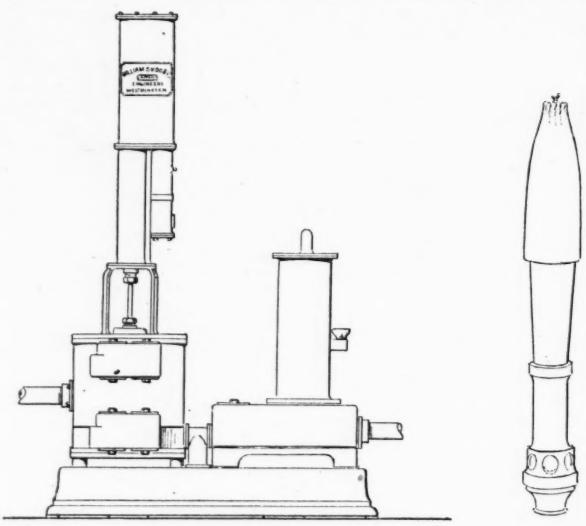
front wall removed, from which you will have no difficulty in conceiving the principle upon which they are set. Instead of brick pillars, we use fire-lumps for supports, to the shape as sketched, and 3 inches thick. There does not appear to be a great deal of difference between your mode of setting and our own, except in the size of the fireplace. We have seven bars in width, which are 2 ft. 6 in. long. The sides of the furnace are sloped as shown, and the front part of it is contracted to 1 foot wide, to fit the opening of the furnace-frame, which is 1 foot square. We generally put four supports under each retort, the back end of which rests on a 4½-inch brick wall—the more support the better, especially at the fireplace. I prefer supports in *one piece* to brick-built pillars, as the fireclay will be liable to be burned out of the joints, and thence the pillar will give way. I take in the "Gas Journal," and have seen the plan you refer to. I had some thoughts of trying the arch last year, but found we had not sufficient height without placing the bars considerably lower. As a substitute for the inner arch, I put fire-tiles 3 inches thick the whole length of the two lower retorts, but these I found cracked and fell down adjoining the fire. Our retorts, which are D's, are 7 ft. 3 in. long by 16 in. wide and 14 in. deep. Out of the 13 cwt. of coke produced per ton of coal, we use about 5 cwt. 38½ per cent.) as fuel. We frequently use small coal and coke mixed for fuel. Trusting the above may be useful,

I remain, &c.,

(Signed) John Crosthwaite.

SUGG'S INCREASED PRESSURE AND CHRISTIANIA INCANDESCENT BURNER SYSTEMS.

Another proof of the strong hold that the incandescent system of gas lighting has taken upon gas consumers the world over, and a further help to the development of the system on scientific and popular lines, is the improved arrangement now being introduced by Messrs. W. Sugg and Co., and actually on view at their Westminster establishment. The accompanying illustration shows the outward appearance of Mr. W. Sugg's patent pressure increaser and water-power and gas regulating apparatus for use in high-power incandescent gas lighting; and the larger-scale figure represents his new and improved pattern of



incandescent burner, which is adapted both to the high-power lights and to the ordinary kind of lighting. It is an interesting circumstance that this new burner is called the "Christiania Incandescent Burner," after the well-known scientific and artistic flat-flame burners and opal globes which have never been equalled in their kind, and have even held their ground gallantly against the more economical incandescent lights. The reason is that, as a matter of fact, Mr. Sugg has now made an incandescent burner that can not only be used with a Christiania-shaped globe, but really looks very well in it. There is no chimney, nor flash-light; but the burner stands on a governor exactly like that familiarized by the old favourite flat-flame system of domestic lighting. All the elegance of the old system is preserved; and, unless we are greatly mistaken, gas consumers in general will be thankful to have the Christiania style of fitting placed in their hands again, with all the added advantages of the incandescent method of producing the light. This success has removed one of the most real objections commonly entertained to the general household adoption of gas lighting by incandescence. It is stated that the mantles last even better in the Christiania-shaped globes than they do in chimneys. The appearance of the light is all that could be desired. The mantle is entirely screened from direct vision, unless one takes the trouble to get underneath the globe and look up into it; and even then the highly-reflecting inner surface of the opal globe cheats the eye. It is unnecessary to say anything for the efficiency of the downward reflection from these light-sources.

To return, however, to the apparatus illustrated. After much experience of attempts to realize the mechanical conditions of the reliable, cheap, and safe supply of gas at the heightened pressure of 9 inches of water at the high-power incandescent burner, Mr. Sugg has produced the device now shown. This arrangement possesses the following characteristics: Water power, obtained from the ordinary town's supply, is the motive force; the whole thing is self-contained, and automatic; the regulation of the supply to the demand is effected by a mercury-sealed gasholder-governor; there are no cocks or taps to jam or leak; any escape of gas or water is practically impossible; and the gas and the water do everything by themselves subject only to the turning off and on of the lights.

The operation of the apparatus is as follows: The upper portion of the combination is a small hydraulic ram, which is in rigid connection, by a vertical prolongation, with a lower gas-cylinder and piston of much larger dimensions. The ram is supplied with water, which may be at any pressure from 20 lbs. to 60 lbs. per square inch; and its reciprocating motion is determined by a very simple piston valve motion, which changes the direction of the flow to the top or bottom of the ram-cylinder on the completion of its stroke. This motion is very quiet, and the ram works with great smoothness. It pumps the gas at once to the required working pressure of 9 inches, or more. The gas at this increased pressure passes into the base of the apparatus, which is made to serve as a reservoir and is capable of holding about twice the contents of the pump. From here the gas flows into the regulating part of the arrangement—seen to the right of the figure—which is, as already stated, a mercury-sealed gasholder in a casing. It will withstand a pressure of 120 inches of water before breaking the seal. The holder carries a central rod, which actuates a lever in the base. The arms of this lever are of unequal length; and at the end of each is a valve taking a bearing on a seat. These valves respectively control the flow of gas from the reservoir, and the discharge at the pressure to which the holder is weighted—say, 9 inches—irrespective of what the pressure in the reservoir may be. No pressure greater than that of the holder can pass into the distributing system. There is provision in the side of the cylinder for filling up the level of the mercury, after which it is screwed up. The double cut-off is automatic in its action; and when the lights are shut off, the accumulated pressure of the gas in the reservoir stops the pump, and consequently the ram. It is like a spring which is always in place and ready to act. Turning on the burner cocks releases the gas pressure; and the ram forthwith starts, running as fast or as slow as the number of lights on may determine. Absolutely no attendance is required, beyond an occasional oiling, or the setting-up of a gland. It must be difficult to surpass the simplicity and economy of working parts in this arrangement.

The next essential of the new improvement, as constituting a Sugg combination, is the atmospheric burner for the high-power lights and others. Of course, Messrs. Sugg and Co. have nothing to do with the manufacture of the mantles. It argues a degree of hardihood on their part, however, to have made one more attempt to improve the bunsen burner for the purpose of incandescent lighting. Yet this they have done, with what success time will show. It is possible meanwhile to direct attention to the salient features of the Sugg lighting bunsen. In the first place, it is a stout, strongly-made article, comparing favourably in this respect with many of the flimsy foreign makes of bunsen, which can be crumpled by the hand with small effort. It is a longish affair, with a central gas-jet formed of steatite, made to send a jet of gas, of the rated quantity for the pressure, vertically upwards through the upper part of the fitting. The holes for the admission of air are in the periphery of the burner-tube, just below the gas-nipple, and are not adjustable. It is contended, indeed, that this burner will work equally well with gas of all qualities usually sold, and within a considerable range of pressure variation. It is not intended that the gas and air should mix in the burner tube. On the contrary, when the top of the burner is away, and the gas-jet allowed to light-back, the flame burns as strongly and straight as that of a jet photometer. The top of the burner is the mixer. It is a simple disc, or button, of unbaked steatite, fitting easily in the metal burner-tube, having a double row of round holes pointing outwards on its upper side, at the rim. In the middle it is solid, with a socket for the foot of the usual mantle carrier. Thus the gas and air strike against the under side of this piece of steatite, and are ignited at the upper holes, the direction of which is adapted to the requirements of enfolding the mantle in the atmospheric flame. The high-power burners are rated to consume 10 cubic feet of gas per hour, at the standard 9 inches water pressure. The duty of nominal 16-candle gas in this case is 30 candles per cubic foot per hour—say, 300 candles per burner. Three of these in a lantern with a semi-translucent top reflector give an actual lighting effect of 1000 candles for 30 cubic feet of gas per hour—in most places costing not more than a penny.

With respect to the smaller Christiania incandescent burners, it should be remarked that, as an old practitioner in this business, Mr. Sugg is no believer in gas-burners consuming less than 3 cubic feet per hour. He has no quarrel with those who like these tiny burners, with their necessarily minute dimensions and small adjustments; but he is no "baby farmer" himself. For

long-continued steady work, year in year out, a burner which can be relied upon to stand to its 3 cubic feet per hour is his ideal; and for this consumption the best useful effect with the Christiana globe is 80 candles. What strikes the eye when looking directly at such a light-source is perhaps 50 candles, spread over a moonlike surface of considerable area, and consequently not dazzling. And, it must not be forgotten, this result is absolutely the same whether the nominal illuminating power of the gas burnt is 14 or 20 candles. Moreover—and this is another important consideration for the consumer—variations of gas pressure from that at which the burner is on the point of "lighting-back," to the highest permitted by the governor, which is 15-10ths, do not make any appreciable difference in the lighting effect of the burner; while the lower working pressures actually enable the gas to score a higher duty. The reason for this is plain. It is the maximum pressure that the burner maker has to prepare for. He must make sure that at the highest pressure of gas at the foot of the burner there shall be enough air drawn in to burn it to proper advantage. When the gas pressure falls below the maximum, less gas passes and the resulting mixture is poorer. But the flame is also hotter, as is well understood. As the pressure of gas falls, the blue flame of the bunsen becomes green, until, just before the explosive proportions are reached, the holes whence the mixture escapes are crowned with emerald dots. Then the sheath of flame is at its hottest; but there is plenty of margin between the minimum and the rated pressures to ensure that the burner shall go on working. Consequently, the gas consumer is in far happier position than the user of incandescent electric lamps of the latest brand; for in this case a reduction of 5 per cent. of the normal voltage will reduce the carbon filaments to the appearance of "red hot hairpins." Sugg's high-power incandescent burners will bear a reduction of from 9 inches to 2 inches gas pressure before firing-back; and the same elasticity, in degree, is enjoyed by the small burners.

Experienced gas engineers will be interested in the restoration of the non-conducting steatite for gas-burner tips to the same place in the bunsen burner as it has occupied for so many years in the luminous flame burner. It is unnecessary to go over the old grounds on which the employment of this useful substance for such a purpose was based. It is sufficient to say they have never been shaken. In the case of the bunsen burner, they hold good equally, up to a point; and the point is certainly far enough advanced to be secure. Lastly, the position occupied by the firm of Messrs. W. Sugg and Co. in the gas industry is so exceptional, and the history of the work of the firm for gas engineers and consumers so remarkable, that we may be permitted to heartily congratulate them on this attempt to recover the lead in gas-lighting appliances of which they were deprived by the partial eclipse of the argand and flat-flame gas-burners by the insistent incandescent lights. Conversely, it is the best possible testimonial to the completeness of the triumph of the latter system that it has conquered the strongholds of the older dispensation, and has practically no rival in its universal domain.

Preventing Gas-Pipes from Freezing.—The Manager of the Cracow Gas-Works has described in the "Praktische Maschinen Constructeur" a method which he has devised for preventing the gas as it leaves the purifiers from causing the pipes to freeze owing to the water contained in the gas. The device consists of a cylindrical box made of brass, and soldered on the gas-pipe; the box containing a wire gauze basket filled with calcium chloride. In passing the basket, the water in the gas is absorbed by the chloride, which gradually becomes deliquescent and falls to the bottom of the box. The liquid can be run off from time to time by the aid of a cock, and then evaporated in the oven to recover the chloride. It would perhaps be preferable to dry the gas just before it enters the mains for distribution. In this way all the inconveniences due to the presence of water in the gas could be prevented.

Gas from Town Refuse.—Steam raising from town refuse is a comparatively old topic; and the fuel value, from this point of view, of all that is implied by the words "town refuse" has been discussed on many occasions, and has been practically illustrated as well in several instances. "It is, therefore, somewhat refreshing," says a writer in the current number of "Cassier's Magazine," "to read of the latest proposed refuse disposal scheme, which is simply to convert the stuff into fuel gas. This, later, is to be used in gas-engines for electric generator driving for power and lighting, leading eventually to an energy system beside which all present and immediately prospective steam-power plants would appear hopelessly antiquated. With the gas generated, of course, at one large producer station, and utilized permanently on the spot, and that spot located on the water front of such cities as have any, the question of power-station coal would be satisfactorily disposed of at once, and that of water as well, for the only water that would be needed would be that for cooling the gas-engine cylinders, and this could be pumped from the river and again discharged into it later. The scheme is decidedly an attractive one. It would solve some municipal difficulties as well as some encountered by private corporations; but, for the present, unfortunately, matter-of-fact figures to give a substantial practical base of operations are entirely lacking."

REGISTER OF PATENTS.

Making Gas for Heating Purposes.—James, R. W.; a communication from the American Stoker Company, of New York. No. 2506; Feb. 3, 1899.

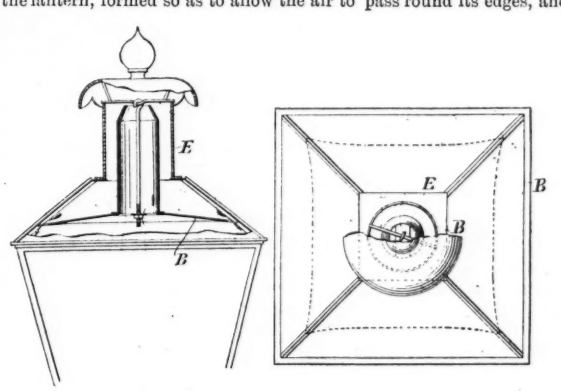
The patentee describes a method of making fuel gas from coal, consisting in distilling and decomposing the hydrocarbons, and passing the products resulting from the distillation and combustion of the hydrocarbons, as well as the products of the combustion of the carbon, over, or in contact with, incandescent carbon; and he points out that his method of making fuel gas is not dependent on the use of the arrangement shown in the drawing accompanying the specification, or, indeed, in any special mechanism.

Up to the present time, it has been, as far as he knows, the universal practice in generators of producer gas, to apply the fresh coal on the top of the incandescent coke; the result being that the gases produced are charged with the water expelled from the green coal, and, under certain conditions, with vaporized liquid hydrocarbons—such as tar. These form unstable gases, which it is the common practice to remove when a stable gas is needed.

One of the principal features of the present invention, therefore, consists in reversing this practice, by the introduction of the green fuel below the incandescent body of coke, instead of above it. The result of this change is said to be marked. In the first place, the water expelled from the green coal, in passing up through the incandescent body of coke, is converted into hydrogen and carbonic oxide gases, which are stable; in the second place, the liquid hydrocarbons are oxidized, and also converted into hydrogen and carbonic oxide gases; and, in the third place—since the distillation of the hydrocarbons takes place in a zone in which free oxygen is present—they are decomposed and converted into carbonic acid gas, which, in its passage through the incandescent coke on its way to the exit-flue, is changed into carbonic oxide, in precisely the same way that the carbonic acid resulting from the combustion of the coke is, on its way to the flue, converted into carbonic oxide. As a result, the gas produced is more nearly pure carbonic oxide and hydrogen, free from moisture and volatilized liquid hydrocarbons; and therefore a stable gas generated as such, and not made stable by any subsequent process—such as washing or scrubbing, or draining-off of the non-stable and deposited constituents. Various difficulties, arising from the unstability of producer gas as now made, are therefore avoided; and a gas is produced which is suitable for general heating purposes. In the manufacture of the gas, steam is introduced, as is the common practice in the making of producer gas, to supplement the combustible gases produced.

Lanterns for Incandescent Gas Lighting.—Talbot, H., of East Dulwich, S.E. No. 5867; March 17, 1899.

This invention consists in means for preventing down-currents of air acting on the flames of incandescent gas-mantles, when used in public lamps. This is attained by the use of a deflector, supported in the roof of the lantern, formed so as to allow the air to pass round its edges, and



also with a central hole having a bar across it, and a contracted chimney extending upwards into the ventilator of the lantern. As in such a type of lantern as that shown the bottom of the lantern would be so far air-tight as to prevent the necessary quantity of air required to support combustion from entering, air for the purpose would enter by the cylindrical ventilator E, and be deflected by the plate B. It would thus be directed down the sides of the lantern, keeping them cool, and would not blow upon the mantle, and render the flame unsteady. An article dealing with this invention appeared in the "Journal" for Oct. 3 last (p. 821).

Generator and Regenerator Furnaces for Gas-Retorts.—Drake, J. A. of Halifax. No. 6092; March 21, 1899.

This invention relates to means for controlling the secondary air in generator and regenerator furnaces and producers where coal, coke, or other combustible material is used.

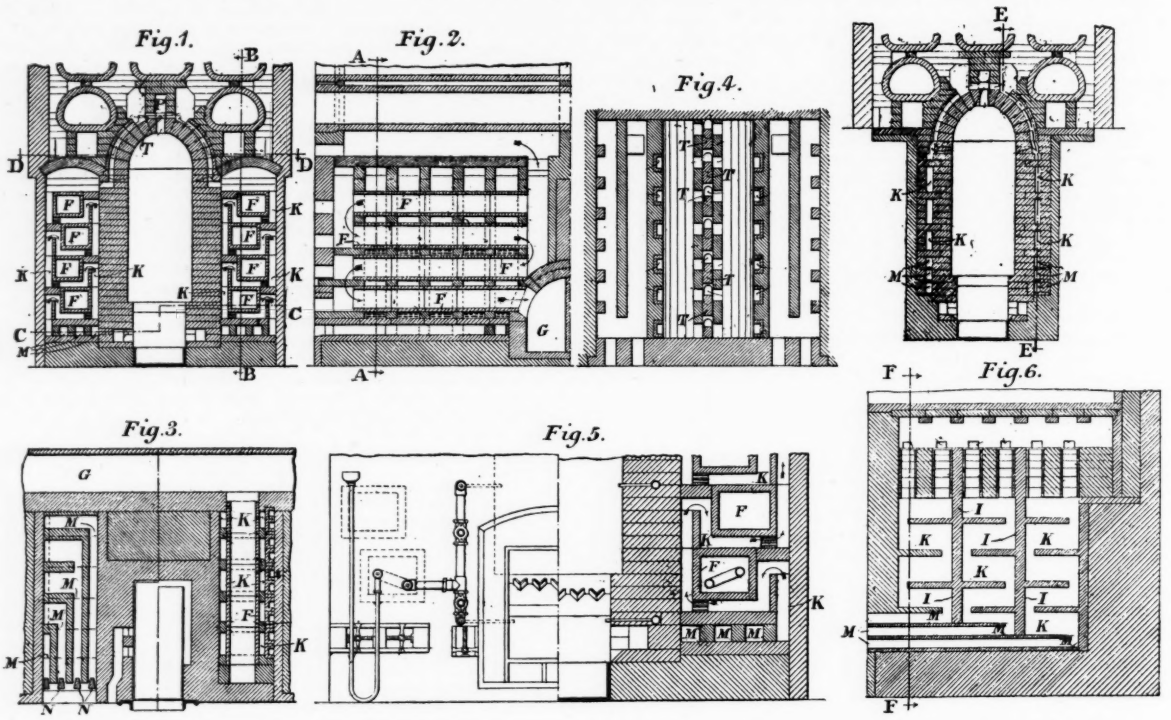
Fig. 1 (p. 682) is a sectional elevation, on the line A of fig. 2, of a producer and recuperator having these improvements applied thereto. Fig. 2 is a longitudinal sectional elevation on the line B of fig. 1. Fig. 3 is a sectional plan on the line C of fig. 1. Fig. 4 is another sectional plan on the line D of fig. 1. Fig. 5 is an enlarged front elevation, partly in section, of the lower portion of the oven or furnace. These drawings show the improvements applied to a recuperative or regenerative furnace of the type described in the inventor's patent of 1898, No. 6160.

After performing their work in heating the retorts, the waste gases pass, by way of channels, to the recuperator-tubes F, which convey them downwards in a zig-zag course from back to front and front to back alternately, in a direction lengthwise of the furnace, as many times as may be desired, and finally deliver them into the main flue or uptake G, for discharge into the atmosphere. Transverse fire-brick walls cover the joints of the tubes F, to prevent leakage arising from shrinkage or settling

down of the foundation work. These walls are made solid from side to side of the recuperative chambers, so as to divide the passages K, up or through which the secondary air passes and circulates around the recuperator-tubes, into several sections longitudinally—such sections having no communication with each other, and therefore differing in this respect from other constructions of recuperators. Leading to the lower or inlet ends of each section of secondary-air passages, are air-channels M, extending longitudinally from their respective secondary-air passages to near the front of the furnace, and terminating in a box provided with sliding doors or valves (see fig. 5), for primarily controlling the admission of air. In addition to the sliding doors or valves, loose wedge-shaped blocks N (fig. 3) are adapted to be moved into, or withdrawn from, the mouths of the air-channels, and so contract or increase the area through which air can pass into the channels. By adjusting these doors or valves, the quantity of secondary air supplied to the recuperator, and therefore to the combustion chambers, can be governed to the greatest nicety to suit requirements. The quantity of secondary air admitted to each of the several sections of the air-passages K can also be regulated as necessary by the wedge-shaped blocks; consequently it is possible "to supply a properly distributed supply of heated air to the combustion chambers from front to back to meet the producer or furnace gases, and ensure perfect combustion."

The means adopted for controlling the supply of producer gases admitted to the combustion chamber consists of a chamber P, into which all the furnace gases pass from the producer chamber, and from which the gases emerge through lateral openings into the combustion chamber, to meet the heated secondary-air supplies. The width of the chamber is rather more than the width of the openings leading thereto from the producer chamber, in order to receive bricks or blocks T of suitable size and shape, which lie flat upon the floor of the chamber P, and are adapted to be moved over or away from the openings as required to effectually check the passage of the producer or furnace gases to the combustion chamber at any point longitudinally, in order to prevent local or unequal heating of the parts of the combustion chamber.

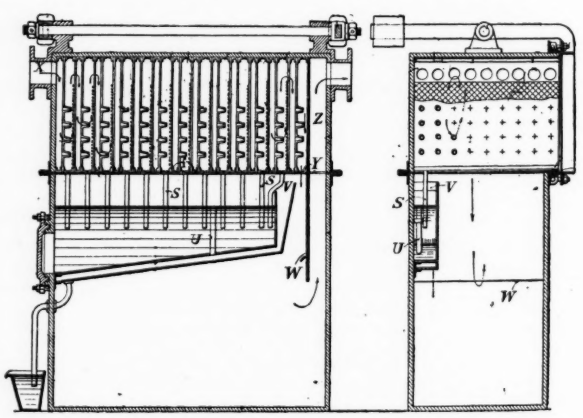
Fig. 6 shows the application of the improvements to a generator furnace, where the waste products of combustion, after heating the retorts, are not employed to heat the incoming supply of secondary air, but are allowed to pass away into the main or exit flue. In this class of furnace, the secondary air is heated by causing it to travel zig-zag over the surface of the heated side-walls of the producer. The transverse walls I are



made solid from side to side of the secondary-air chamber—thus forming a series of separate and independent air-passages K, each of which opens respectively at its inlet end into an air-conduit M. The admission of air to these conduits is controlled by a sliding door or valve at the inlet-end of each channel, or, if desired, the conduits may open at their inlet ends into a box or chamber having sliding doors or valves, to regulate the total quantity of secondary air supplied to the furnace; and the admission of air to each individual air-channel may be regulated by the wedge-shaped blocks already referred to.

Purifying Gas.—Guillaume, N. A., of Paris. No. 12,295; June 13, 1899.

This apparatus is more especially intended for use in connection with gas-generators working by suction under the action of a pump or motor. It is constructed (as shown) with two chambers, one above the other, and separated by a horizontal partition. The upper chamber is divided into compartments by plates, preferably arranged to slide between guides or angle-irons. The partitions are provided with conical openings and nozzles. The partitions also have corrugated surfaces or reticulated or perforated plates on the side presented to the nozzles, so as to provide a large surface against which the gas on issuing impinges. At the upper part of each of the partitions, are openings for the passage of gas into the adjacent compartment. The upper chamber is provided at one side with a cover fixed (gas-tight) to levers mounted on a shaft, and balanced by counterweights. The liquid and impurities entering with the gas are arrested in each compartment of the chamber by the corrugated partitions or perforated plates, and pass downwards and through pipes S into a reservoir arranged on one side of the lower chamber. These pipes close the direct passage of the gas from one chamber to the other; and to secure this, they dip into a sufficient quantity of liquid. U is an overflow-pipe for regulating the level of liquid in the reservoir, and conducting any excess outside the apparatus. V is an auxiliary passage, to regulate the outflow of the liquid. The gas enters the apparatus at X to the first compartment of the upper chamber, and passes successively through the several compartments, as indicated by the arrows. As it passes through the nozzles of the partitions of one set, it strikes against the corrugated partitions of the other set. This intercepts the liquid and impurities; while the gas flows from compartment to compartment, and after repeated impacts "reaches the last compartment completely purified." In the bottom of the compartment are openings Y, forming direct communication between the top and bottom chambers. The gas passes into the lower chamber (which constitutes a reservoir, and is provided with a depending and elastic partition W, and is drawn off by the supply-passage Z), formed by the walls on one side and the depending

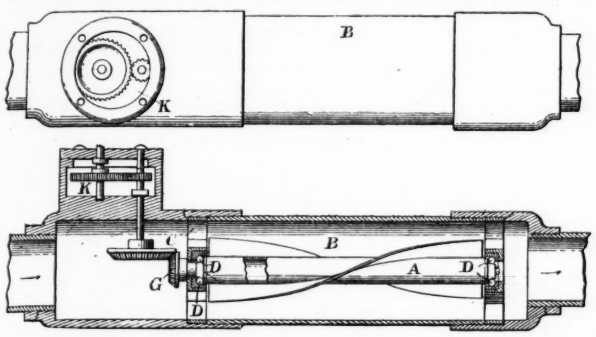


elastic partition W on the other. If from any cause the gas is taken off too rapidly, the increased suction causes this elastic partition to approach the wall, and so reduce the section of the gas-passage. The partition thus regulates the supply of gas; the lower chamber with its moving partition acting to a certain extent as a gas pocket or bag.

Fluid-Meters.—Chesley, S. A., of Lunenburg, Nova Scotia. No. 24,192; Dec. 5, 1899.

This invention relates to a water-meter which will allow the free, practically straight, and unobstructed flow of water through it, with no abstraction from the force of the current beyond the bare minimum amount necessary to actuate the registering clockwork; is free from liability to become choked or clogged; and in which the end-thrust on the rotating shaft or spindle is reduced to a minimum.

The rotary part of the meter consists of a spindle or shaft A, having thereon two opposite helical fins or flanges of long pitch, with an angular relation with the shaft of about 30°. The shaft is journaled in a tubular casing, composed of a main section B, an end section, and a cap-section, united by screw joints. The contracted orifice in the end section is internally threaded for connection with the pipe from which the water enters the meter; while the contracted orifice in the cap-section is similarly threaded for connection with the outlet from the meter to the



point of consumption. The two openings b b^1 are in axial alignment with the shaft. C are the bearings for the journals of the shaft. They consist each of a spider, whose hub-portion is formed with a cup to receive a series of balls D. The journals of the shaft are provided with cones, which co-operate with the cups and balls so as to provide ball bearings for it. On the further end of the shaft is a bevel gear-wheel G, which meshes with a similar wheel on a vertical shaft at right angles to the spindle, and which passes into a chamber K (formed by a tubular projection), where it actuates a dial train of any suitable character.

APPLICATIONS FOR LETTERS PATENT.

3703.—Goodman, G. O., "Gas-stove water-container." Feb. 26.
3721.—Impey, G. D., "Automatic gas-tap." Feb. 26.
3735.—Heinroth, P., and Tresenreuter, G., "Incandescent gas-burners." Feb. 26.
3745.—Messer, A., "Acetylene gas-generators." Feb. 26.
3776.—Brown, A. E., "Coke-pusher machines." Feb. 27.
3839.—Martini, A., "Gas-mixing apparatus." Feb. 27.
3840.—Duncan, J. H. H., "Manufacture of incandescence bodies." Feb. 27.
3844.—Lancaster, E. W., "Acetylene generators." Feb. 27.
3850.—Willey, E., "Gas-engines." Feb. 28.
3860.—Leaver, J. R., "Gas-brackets." Feb. 28.
3874.—Bradshaw, T. P. R., "Artificial lighting." Feb. 28.
3925.—Helmecke, H., "Mantles for incandescent gas lighting." Feb. 28.
3970.—Millar, F. J. M., and Eede, C., "Gas-stoves." March 1.
3987.—Scott, E. G., "Manufacture of sulphate of ammonia." March 1.
3995.—Place, J., "Mantles for incandescent gas-light." March 1.
4010.—Drinker, R. C., "Apparatus for measuring intensity of light." March 2.
4082.—Brown, A. E., "Hoisting and conveying machines." March 3.
4098.—Walker, J. H., and Welch, W. H., "Gas-burners." March 3.

A Large Improvement in the Distribution System of the British Gaslight Company at Hull.—For the purpose of improving the gas supply to the Newington portion of their area of supply at Hull, the British Gaslight Company have undertaken the laying of new mains for a distance of 4¼ miles, at a cost of something like £13,000. The Contractors are Messrs. John Aird and Sons.

Acetylene v. Electric Lighting at Sydney (N.S.W.).—In the "Journal" for the 27th ult., reference was made to the installation of acetylene lighting on the Cricket Ground at Sydney by the Acetylene Gas Company of Australasia, Limited, who hold the acetylene and carbide of calcium patents for the whole of Australasia. The object in lighting the ground was to allow of evening bicycle races; and according to the local papers the track is as well illuminated for racing purposes as if the sun were shining. The "New South Wales Cyclist" says the acetylene light has been "acknowledged on all sides to be superior to the electric light previously in use;" while a rider states that, compared with the latter light, acetylene is "brighter, steadier, and more pleasant to ride under."

The Gas Supply of Salford Out-Districts.—Questioned with regard to the alleged unsatisfactory quality of the gas supplied to Higher Broughton, Alderman Phillips, at the meeting of the Salford Borough Council last Wednesday, stated that the Gas Committee could not, even if they wished, give Higher Broughton a lower quality of gas than other parts of the area of supply. He, however, admitted that, owing to the immense increase in house-building in the lower part of the district, the present main was insufficient; but the Council were about to be asked to approve of the construction of a new one which would be 36 inches in diameter, instead of 24 inches as at present. The Mayor intimated that he had a communication from a number of gentlemen at Higher Broughton, requesting that a public meeting should be called to consider the matter. Alderman Phillips said his Committee would take great care to investigate the cases of all the signatories to the requisition. After this investigation had taken place, he would put himself in communication with the Mayor, who might then exercise his judgment as to whether or not a meeting should be called. Subsequently, the Council accepted a tender for the supply of 900 yards of cast-iron mains, 36 inches in diameter, at £6 10s. per ton, and the requisite connections at £9 10s. per ton. Alderman Phillips said the effect of this resolution would be to increase the supply to the Lower Broughton, Higher Broughton, and Prestwich districts, where the Gas Committee were not now able to supply as much gas as was required.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Presence of Naphthalene in Coal Gas.

Sir,—The paper read last night by Mr. R. W. Allen on this subject, at the London Section of the Society of Chemical Industry, proved of altogether absorbing and unexpected interest—both to those of our members concerned in the more purely scientific aspect of the question, as well as to the members of the gas profession who have only too intimate an acquaintance with the difficulties suggested by the mere mention of the word "naphthalene." Some of Mr. Allen's work has already received notice in your columns (see Vol. LXXIV., pp. 590, 595, 755); and the absence last night of Mr. W. Young, of Peebles, and, may I add, of Mr. Lewis T. Wright, formerly a member of the London Section, was a distinct loss to our discussion.

The hour was too late—there being another paper still on our programme—for me to be able to do more than indicate in the discussion that followed one of the points in the paper affecting the new processes of removal of naphthalene in gas by passage through mechanical washers; heavy oils already saturated with light hydrocarbons being the solvents. Mr. Lacey, Mr. Helps, of Croydon, and Mr. Butterfield, who contributed so much to our discussion, had not dealt with this particular point. Nor had the author, in his extreme modesty, and his anxiety not to pad his paper, done more than allude to the practical advances made by Dr. Bueb, of Dessau, and Mr. Leather, of Burnley; as he approached the subject from the laboratory point of view, disclaiming possession of any knowledge acquired by personal experience outside in practice.

Mr. Allen distinctly stated that coal gas, deprived of naphthalene by his elaborate provisions for this end, might still deposit naphthalene on travelling underground through mains and service-pipes. If this is actually the case, of what avail are the washing processes? Hence I asked the gas engineers and chemists present if, in the absence of Mr. Leather, any information was available from Burnley experience of the absence or presence of naphthalene in any newly-laid mains and service-pipes, if such existed in direct connection with the distributing centre. Mr. Butterfield had already cautioned the meeting as to inferences to be drawn from the presence of solid deposits of naphthalene at any particular point in the distributing system. These might have come down in solution in liquid form at one time, and then the solvent be removed if—as might easily happen—gas unsaturated with that particular hydrocarbon followed on at a subsequent time. I ventured also to add that transferences of deposits might occur through the alternation of periods of gas supply saturated and unsaturated, *quâ* the lighter hydrocarbons and *quâ* naphthalene, with varying atmospheric conditions. It was therefore necessary to appeal to Mr. Leather's experience, if he could supply it; and I would now add, as the meeting could vouchsafe no further light, that deposit of naphthalene in such ideal conditions of clean mains, &c., as I have indicated would only support Mr. Allen's theory—or, rather, I will call it, working hypothesis (it is quite right that he should frame one)—if Mr. Leather could assure us that continuous tests of the gas supplied to such a main contained no naphthalene. Mr. Allen's hypothesis certainly upsets all one's preconceived notions of naphthalene as only formed at high temperatures; but let us keep an open mind, and not despise a working hypothesis merely on that account.

I have always felt the advantage to our sectional meetings of papers affecting the gas industry, as we are far more likely to get a frank and complete discussion of knotty points from members of the profession; the conditions of the industry varying from those of any other chemical industry known to me. Discussion is not hampered by the fear of a possible unpleasant interview with a director next morning, for having let technical zeal outrun business discretion. Unless a patent is in view, a gas chemist or engineer can help his *confrère* without fear. Too often, from the very necessities of business competition, our discussions have had to cease at the point where the listeners would acquire really informing facts. The gas industry must, as time goes on, become increasingly dependent on chemical as well as engineering skill; the newer processes discussed year by year at the meetings of the Institution of Gas Engineers and of the Gas Institute, and the weekly contents of your valuable paper, bear testimony to this.

You have, Sir, devoted space to the notice of one of the most valuable contributions of our late President (Mr. George Beilby) to the Society's "Journal" (his address as President, at Newcastle, in July, 1899); but you did not notice the very thoughtful and valuable paper read at the London Section in April of the same year, on "The Relations of the Society to Chemical Engineering and Industrial Research." The first branch of this paper concerns me most; and it is to the national importance of this subject that I desire to direct the attention of members of the gas profession. No better exponent of it could be chosen than Mr. Beilby; and I commend to the notice of all his paper (see "Journal of the Society of Chemical Industry," Vol. XVIII., pp. 333-340).

March 6, 1900. R. Forbes Carpenter.

The Low Price of Benzol and Creosote.

A correspondent has called attention to a matter which appears to him to be a little puzzling, and which he thinks is of considerable interest to the gas producing and consuming world. He remarks that when 90's benzol was at 1s. 6d. per gallon, considerable quantities were used for the purpose of enrichment; but now that it has dropped to about one-third of this price, there appears to be no inclination on the part of gas managers to make use of this most valuable, and at the present time extremely cheap, enriching agent. He thinks there must surely be some excellent reason for this; and he asks if any of our readers are able to clear up the mystery. Writing on the subject of the price of creosote, a large firm of tar distillers point out that this product is now very much lower in value than it has been for a considerable time. They say that though the latest quotation given in the "Journal" is 3¼d. per gallon, sales have, to their knowledge, recently taken place at 2¼d.; and they have themselves offered creosote at 2⅝d. per gallon without finding a buyer.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

The Barnsley Corporation Bill was read a second time.

The East Shropshire Water Bill, the East Stirlingshire Water Bill, the Falkirk and District Water Bill, the Falkirk Corporation Bill, the Great Berkhampstead Water Bill, the Hemel Hempstead Corporation (Water) Bill, and the Motherwell Water Bill were referred to a Select Committee, consisting of the Earl of Camperdown (Chairman), Earl Grey, the Earl of Dartry, Lord Saltoun, and Lord Sinclair; to meet on Tuesday, March 13.

The Higham Ferrers Water Bill, the Menstone Water (Transfer) Bill, and the Newport (Mon.) Gas Bill were referred to a Select Committee, consisting of Lord Windsor (Chairman), the Earl of Lucan, the Earl of Verulam, Lord Manners of Haddon, and Lord Newton; to meet on Tuesday, March 13.

A large number of petitions were presented against the South Essex Water Bill.

HOUSE OF COMMONS.

Tuesday, March 6.

SOUTH METROPOLITAN GAS BILL.

Mr. LOUGH moved, in reference to the above-named Bill—"That it be an instruction to the Committee to insert such clauses in the Bill as may be required to give effect to the first and second recommendations of the Select Committee on the Metropolitan Gas Companies, as follows: '(1) That the standard price should be reduced to 3s. 3d. to carry the standard dividend of 10 per cent., and that the existing scale of increase and decrease for dividend of ¼ per cent. for every penny of decrease or increase of price below or above 3s. 3d. be maintained, and that a secondary or additional scale be imposed which should permit of an increase or decrease of dividend over and above that regulated by the present scale of ¼ per cent. for every complete 3d. of decrease or increase below or above the standard price of 3s. 3d. (2) That the area south of the River Thames, at present part of the district of the Gaslight and Coke Company, should be transferred from the Gaslight and Coke Company to the South Metropolitan Gas Company, at a fair and reasonable price.'" The honourable member explained that, though the instruction looked complicated and technical, it dealt with only two principles—it reduced the standard price of gas by 3d. per 1000 cubic feet, and it provided a new sliding-scale, the effect of which was that if the price was less than 2s. 4d. it allowed a rather higher dividend than at present—thus affording a great inducement to the Company to reduce their price.

Mr. MARKS, who had placed upon the paper a notice in similar terms, in seconding the motion, pointed out that the recommendations embodied in the instruction had been arrived at by the Select Committee of last session after a very careful and exhaustive inquiry.

Sir J. RANKIN (the Chairman of the Committee referred to) moved, as an amendment, to insert after the word "Committee," in the introductory portion of the instruction, the words, "to consider whether it would be desirable." He explained that the alteration would deprive the instruction of its mandatory character, and it was the more desirable to take this course because the instruction, if carried, would affect the Gaslight and Coke Company equally with the South Metropolitan Company.

Mr. RITCHIE suggested that the honourable member (Mr. Lough) should accept the amendment, because the Companies had not been heard upon the recommendations of the Committee of last session. He added that he thought the Bills of the two Companies specially concerned would go before the same Committee.

Mr. LOUGH thereupon accepted the amendment; and the instruction, as altered, was agreed to without a division.

Thursday, March 8.

GASLIGHT AND COKE COMPANY BILL.

Mr. LOUGH moved, with respect to the above-named Bill, an instruction to the Committee by whom it will be considered in the terms of the one he submitted to the House on Monday in reference to the South Metropolitan Gas Bill, but with the addition of the third recommendation of the Select Committee of last session on the Metropolitan Gas Companies' Charges—viz., "That the charge made by the Gaslight and Coke Company for the rents of automatic meters and stoves should be the same to consumers north and south of the Thames for fittings of the same quality and capacity."

Mr. MARKS, who had placed upon the paper a notice to move a similar instruction, seconded the motion.

Sir J. RANKIN proposed to amend the instruction by inserting after "Committee" (see above) the words "to consider whether it is desirable," to which the House agreed in regard to the South Metropolitan Bill.

Mr. BOULNOIS expressed the hope that the House would accept the amendment, coming as it did from the honourable member who presided over the Select Committee who considered the subject last year.

Mr. PICKERSGILL said the effect of the amendment was simply to reopen the whole question. As the House did not adopt the suggestion he made last year that the Committee should inquire whether or not it was desirable that the statutory provisions with regard to the price of gas and to the dividend should be revised, he felt bound to vote for the amendment.

Mr. RITCHIE said it would be most unwise for the House to commit itself to the *ipsissima verba* of the instruction without hearing evidence. He therefore hoped the honourable member for Islington (Mr. Lough) would assent to the amendment, so that the instruction might not go to the Committee in a mandatory form.

Mr. BRYNMOR JONES and Mr. COHEN, both of whom were members of the Select Committee of last year, appealed to the honourable member to accept the amendment.

Mr. LOWLES said he hoped nothing would be left undone to secure that consumers on the north side of the Thames should have their gas on the same terms as those on the south of the river.

The amendment was agreed to; and the instruction, as amended, was adopted.

The following further progress was made with Private Bills last week:—

Bills read a second time and committed: British Gaslight Company (Staffordshire Potteries) Bill, Ossett Gas Bill.

Bill reported with amendments: Rugeley Gas Bill.

The North Warwickshire Water Bill, the Ossett Corporation Gas Bill, the Ossett Gas Bill, and the Woodbridge District Water Bill were referred to a Select Committee, consisting of Mr. Lewis Fry (Chairman), Sir John Kinloch, Mr. Cornwallis, and Mr. C. P. Trevelyan; to meet on Tuesday, March 13.

The Airdrie, Coatbridge, and District Water Trust Bill, the Hartlepool Gas and Water Bill, the Morecambe Urban District Council (Gas) Bill, the Southport Water Bill, and the Wetherby District Water Bill were referred to a Select Committee, consisting of Sir T. Gibson-Carmichael (Chairman), Sir C. Gull, Mr. Carlile, and Mr. Horniman; to meet on Tuesday, March 13.

The Bedford Gas Bill, the Glastonbury and Street Gas Bill, the Glastonbury Corporation Gas Bill, the Mid-Kent Water Bill, the Rickmansworth and Uxbridge Valley Water Bill, and the St. Albans Water Bill were referred to a Select Committee, consisting of Mr. Schwann (Chairman), Captain Bethell, Mr. Doogan, Mr. Moon, and Mr. Bonham Carter (Referee); to meet on Thursday, March 15.

The Southwark and Vauxhall Water Company have petitioned against alterations in the East London Water Bill; and the Reigate Corporation have sent in a requisition to withdraw their petition against the Redhill Gas Bill.

On Saturday, the Portland Urban District Council applied for leave to present a petition for a Bill to enable them to acquire the gas-works supplying their district, in accordance with the arrangement referred to in the "JOURNAL" last Tuesday (p. 620).

The Battersea Vestry petitioned in favour of the London Water (Welsh Supply) Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, March 8.

(*Before Mr. Justice* MATHEW, *without a Jury.*)

Jones and Attwood v. Laindon Gas and Water Company and Others.

This was a claim by the plaintiffs, who are Contracting Engineers at Stourbridge, against the defendants for £73 odd, the price of a quantity of 4-inch iron piping supplied to them for the purpose of providing water in the Laindon district in Essex.

Mr. AMPHLETT, Q.C., and Mr. NEWSOM appeared for the plaintiffs; Mr. ATKIN represented the Company; and Mr. WILLES CHITTY and Mr. NEWBOLT, the second defendants, Messrs. Usill, Browne, and Usill.

Mr. AMPHLETT, in opening the case, stated that in December, 1898, the plaintiffs' London Agent, Mr. Newton, had an interview with Mr. Tarbett, who appeared to be acting for the defendant Company, and who represented that Messrs. Usill, Browne, and Usill were acting as Engineers for the Company for the purpose of carrying out the works to be executed. Plaintiffs' case was that in January, 1899, Mr. Usill gave Mr. Newton a verbal order for the goods in question, in the presence of Mr. Tarbett, and on behalf of the Company. One consignment was then sent to Laindon, and taken away by Mr. Usill and laid along the road where the pipes were supposed to be wanted. When plaintiffs sent the invoice, however, the Company repudiated any liability, and said the plaintiffs must look to the Engineers who ordered them. But Messrs. Usill, Browne, and Usill also repudiated any liability, and said that they were only acting as Engineers for the Company, and had ordered the goods on their behalf. Mr. Newton said Mr. Usill had stated that he had the Company's written authority to give the order; but plaintiffs had never been able to see it. Two other consignments of pipes had been sent in the meanwhile, and these were lying at Laindon station awaiting defendants' instructions. The question therefore was, which of the defendants was liable, as the Company denied that the Engineers had any authority to order the goods on their behalf.

Evidence having been given in support of the plaintiffs' case,

Mr. *Usill* was called, and denied liability.

Cross-examined by Mr. ATKIN, for the Company, he admitted that at one time he was interested in the business, and was prepared to find persons to furnish capital for extending it. On the water being analyzed, however, he found he could not conscientiously recommend anyone to invest his money. The gas powers had also lapsed; and it was necessary to get them revived before the Company could continue business. To do this, it was necessary to have a Board of Trade inquiry, and show some signs of activity; but he denied that he ordered the pipes on his own authority for this purpose, and also that he had ever stated he had the Company's authority to order them.

Mr. *Holmes*, the Chairman, and one of the Company's Directors denied that the Company had ordered the goods, or that they authorized Mr. Usill to do so on their behalf. The capital of the Company was £3000, in £1 shares, which were all allotted to the vendors. The only business they had done was to supply one hotel and two cottages with gas. He did not admit that the water when analyzed turned out to be bad. The Company did not want the pipes, and had not used them. It must have been a pure speculation on Mr. Usill's part when he was hoping to carry through a scheme of reconstruction of the Company with his financial friends.

Justice MATHEW said he was clearly of opinion that the Company was not liable and that the Engineers were. The Company came into existence in 1896, and had failed to continue the business for which it

was formed. The concern was in an utterly inanimate condition in 1898—the gas powers having lapsed. He knew nothing about the shares, except that they were all held by the vendors and none by the public. Who the vendors were he did not know, nor did he know anything else about them or the debentures which were said to exist. Mr. Tarbett and Mr. Usill seemed to be of opinion that the Company might be resuscitated; and for this purpose it was necessary that the gas powers should be revived and the water powers extended. To get this done, it was necessary that there should be a Board of Trade inquiry; and it was hopeless to expect a satisfactory report from an Inspector unless there was some show of activity. For this purpose, Mr. Usill appeared to have ordered these pipes; and as he had no authority from the Company to do so, his firm must be held liable for them. There would be judgment for the plaintiffs for certain damages to be assessed against the Engineers in consequence of the defendants' non-acceptance of the goods, and judgment for the Company, but without costs.

Committal for Selling Infringing Mantles.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Kekewich, Mr. Walter applied, in the case of *The Incandescent Gas-Light Company, Limited, v. Collins*, for the committal of the defendant for breach of an injunction which had been granted restraining him from selling mantles which were infringements of the plaintiffs' patent of 1886. It was explained that the defendant had already been sent to prison twice for a similar offence; the last occasion being on the 17th of November last. The defendant appeared in person, and contended that the plaintiffs' patent had expired. They had refused to supply him with their mantles on any terms. His Lordship made the usual committal order; and the defendant was taken into custody.

The Payment of Water-Rates for Small House Property.

At the Thames Police Court, on Monday last week, an applicant told Mr. Mead that he was a weekly tenant, and that his landlord had refused to pay the water-rate. The East London Water Company had attached his rent under the Water Companies (Regulation of Powers) Act until the amount due to them by the landlord had been paid. He was now threatened with the brokers by his landlord because he had paid a week's rent to the Company and not to him. Mr. Mead remarked that if the landlord distrained wrongfully, the applicant would be able to bring an action against him. A representative of the Company said it was very hard on the tenant. He was bound to pay the rent to them under their attachment; and because he had done so, the landlord had given him notice to quit. Mr. Mead said if the Company sympathized so much with the tenant, they should proceed against the landlord by summons in the ordinary way, instead of getting the money from the tenant under the Act mentioned.

The Charge of Falsifying Books and Embezzlement.

At the Lambeth Police Court last Wednesday, before Mr. Hopkins, Frank Fairfield Norris was brought up in custody, he having failed to find the bail demanded on the last occasion (*ante*, p. 619), to further answer a summons complaining that he, being an officer employed by the Directors of Frank Wright's Prepayment Gas-Meter Corporation, Limited, did on various dates unlawfully, wilfully, and with intent to defraud, alter and falsify certain books of account belonging to his employers. There was a second summons against the accused for embezzling money received by him on account of the Directors. Mr. Wontner appeared in support of the summonses; but the prisoner was not legally represented. Evidence in support of the charge advanced by the Company had previously been taken at some length. It had reference mainly to the accounts, and was directed to showing the manner in which the defendant was alleged to have dealt with payments received by him on behalf of the Corporation. He now questioned one of the clerks as to payments of particular sums by way of commission, which were stated to have been made to certain officials of gas companies. At this point Mr. Hopkins intervened, and said he could not imagine how it could be material, upon a question of embezzlement, to show that the Corporation had paid what might be illegal commissions. The further hearing of the case was adjourned; his Worship offering to accept the same bail as that fixed on the last occasion—viz., one surety in £250, or two sureties in £125 each.

Stealing the Plymouth Gas Company's Coal.

For systematically pilfering coal belonging to the Plymouth and Stonehouse Gas Company, a youth named Edward Avent was last week committed to prison for a month. The accused and other boys had been making it a practice to take coal from the carts passing along the quay during the discharging of cargoes. He had been repeatedly warned, and had previously been imprisoned for the same offence. It was stated that the loss of coal was considerable, and that boys were tempted to steal it because people were always prepared to purchase it from them.

Increases in Price.—The Morley Town Council have decided to raise the price of gas from 2s. 4d. to 2s. 7d. per 1000 cubic feet as from the 1st prox. The Totnes Gas Company, who recently sent out a notice to the consumers of an immediate advance of 6d. per 1000 cubic feet in the price of gas, have withdrawn that, and have substituted for it one to the effect that the price will be increased by 1s. per 1000 cubic feet from the 25th inst. The price will then be 4s. 6d. per 1000 cubic feet. The Gas Committee of the Walsall Corporation recommend that, owing to the high price of fuel and labour, an advance of 3d. per 1000 cubic feet in the charge for gas should take place from the 1st prox. The Newtown Gas Company have announced an increase of 2d. per 1000 cubic feet; making the price 4s. 5d. where the consumption does not exceed 100,000 cubic feet, and 4s. 3d. where it is above this quantity.

MISCELLANEOUS NEWS.

THE DAMAGE TO GAS-MAINS THROUGH SEWERAGE OPERATIONS AT SHREWSBURY.

Arbitration Proceedings.—Monday, March 5.

At the Westminster Palace Hotel, London, the proceedings were to-day resumed in an arbitration (part heard at Shrewsbury—see *ante*, p. 549) with respect to a claim for £1583 made by the Shrewsbury Gas Company against the Shrewsbury Corporation, as compensation for damage alleged to have been caused to their mains, with consequent loss of gas, in carrying out the new system of sewerage in the town.

Mr. James Mansergh was Umpire. Mr. Corbet Woodall was the Arbitrator for the Company, for whom the Hon A. Lyttelton, Q.C., M.P., and Mr. Spearman appeared. Mr. J. H. Redman was Arbitrator for the Corporation, who were represented by Mr. F. A. Bosanquet, Q.C., and Mr. A. Graham.

The case for the Company having been concluded at the previous sitting, evidence was at once called for the Corporation; Mr. Bosanquet intimating that he did not propose to make an opening speech in a case of this kind.

Mr. *Midgley Taylor*, of Messrs. John Taylor and Son, said he was responsible for carrying out the main drainage system in Shrewsbury, which was an intercepting scheme to prevent the outfall of sewage into the River Severn. Witness proceeded to explain in detail the course of the sewers constructed. With regard to the gas-pipe nearly opposite the entrance to the Old Brewery, it was not disputed that the pipe was drawn there. Considerable damage was done at the time of constructing the sewer; and the contractor paid a large sum to the Gas Company in consequence. At this point, they got into a sort of running sand; and every piece of timber here was left in. At the Red Lion public house in Castle Foregate, they had three gas-mains, three water-mains, and an old sewer to contend with. A gas-main crossed the trench, and the timber was all left in. There was considerable trouble near Queen Street. The only place where he saw a gas-pipe actually in the trench was at Argyll Street. The ground there was fairly good; but the upper portion of the road was made of tipped material, which was in a very loose condition. It was in this loose material that the gas-pipe was laid. A fracture was said to have taken place at or near the manhole opposite the Boat-house Inn. Here the sewer which came down from Post Hill, until it reached the manhole, was shallow; but the one which ran along the river bank adjacent, being a gravitation sewer, was at great depth. The sewer from Frankwell to the Boat-house Inn was all in tunnel, in a hard sand like a soft rock; so that it was impossible for any settlement to have taken place on that side of the manhole. The shallow sewer did not pass over, but joined, the deep sewer at the manhole. He could not say where the break occurred in this pipe. Speaking of the sewer pipes generally, he said they were nearly all of cast iron, varying in diameter from 9 to 30 inches. The work was commenced in July, 1896; and the sewers took about two years to construct. Being cast-iron pipes, they were able to ram the ground more than if they had been of stoneware. With regard to timbering, it was the uniform practice of his firm to include in the quantities a certain sum for timber which would have to be left in the ground. In this case, they allowed £250 for the purpose. The timber paid for amounted to £1570, for which there was obtained and used 21,438 cubic feet of walings, struts, and runners, and 35,639 superficial feet of poling boards. In addition to the timber, wherever they considered it necessary they supported the pipes with concrete. He had been over the trenches many times. Generally speaking, they had settled extremely little. The maintenance that the contractor had had to do on the trenches was very small. Witness had never seen anything other than a slight vertical settlement—nothing approaching a lateral movement. It was impossible to open any trench without occasionally interfering with the water or gas services or mains; but when damage of this kind occurred, the men at once repaired it—in the case of the gas-mains, by putting on a piece of clay or wrapping it round, and then giving notice to the Company. The leakage which would take place under these circumstances would be exceedingly small.

Mr. Bosanquet: Now as to the escape. If the roadway is consolidated above the gas-pipes and untouched, had that any effect in preventing escapes from the gas-mains?

Witness: Yes; the road surface practically forms a seal to the gas, and it is restrained from free escape by the soil surrounding the pipe, and by the road surface.

When the road surface is opened, apart from opening the pipes, what effect would that have on the gas?—It gives the leakage, if it already exists, a very much freer vent; and it is in this way that many escapes have, in my own knowledge, been pointed out to the Gas Company—not alone in connection with this scheme, but in many similar schemes.

In course of further examination, witness handed in a diagram, based on figures supplied by the Company, showing the lines of leakage claimed by the Company, and also what he considered to be the true line. He suggested that the extra leakage was accounted for by the increased consumption, the new main, and the increased pressure. The diagram showed that the percentage of leakage and amount of consumption varied in opposite directions in certain cases, but not in others.

Cross-examined by Mr. Lyttelton: There was no leakage before 1898 amounting to 8 per cent.

Mr. Lyttelton: Do you not draw any inference from the fact that the leakage in 1897, 1898, and 1899 had reached points higher than it had ever attained in the preceding 16 years.

Witness: Yes; I have drawn the inference that you laid a new 15-inch main; that you increased the pressure in a very large portion of the area over the English Bridge; that your supply and gas to account for went up in an abnormal way; and that therefore you get an abnormal amount of leakage. That the increase of leakage was entirely due to the 15-inch main is quite as good an inference as that it was due to anything connected with the system of drainage. I have seen three places opened on the 15-inch main, and have smelt leakage from that pipe on the English

Bridge; but I am not alleging that the leakage was only from the 15-inch main.

Are you aware that the 15-inch main is not on the English Bridge?—It is true you have a box-pipe over there. The joint I saw there leaked. With reference to the allegation of 116 drawn joints in Berwick Road, I cannot dispute that, because I do not know. At Castle Foregate, every precaution was taken. There was considerable difficulty there; but the trenches were well rammed.

Mr. *Alfred Bard*, examined by Mr. GRAHAM, said he was the Resident Engineer to the Shrewsbury main-drainage scheme. Particular attention was given to ensure that the filling in of the trenches and excavations was well done. Four inspectors were employed by the Corporation; and witness was satisfied that the work had been properly carried out.

Mr. GRAHAM: Generally speaking, as regards the sinking of the ground in the trenches, what do you say?

Witness: There has been the sinking you always get in trenches; but if anything, it has been rather less than usual, and the repair done to the road was remarkably small. I think the contractor, in that respect, has had a very easy job. We have not had a case of settlement in the road adjoining the trenches. We made a point of avoiding the gas-mains where possible.

Do you corroborate the evidence given by Mr. Taylor, that where you approached the gas-mains you left in large quantities of timber?—Timber in large quantities; and, in points of special difficulty, concrete. In nearly all the places where complaints have arisen, almost the whole, if not the whole, of the timber was left in. I have had numerous opportunities of inspecting the nature and quality of the joints in the gas-mains, and have never found any which I would have accepted or been responsible for. The caulking and yarning was very slight; and the caulking of the lead itself in some cases absolutely nothing, and in others very trivial. The joints would be sufficient to stop gas; but there was no stability beyond that to hold the pipes together. In the joint on a 5-inch main there was less than ¾ inch of lead.

Have you found, in opening down to the gas-mains, that there has been considerable leakage?—We found that very generally. There has been large leakage.

Have you found anything in the angle at which the pipes have been laid?—In several instances we have noticed that the pipes, where it was necessary, or where the Gas Company thought it necessary, to go round a curve, instead of curved pipes being used, two straight ones had been put in at an angle. You could get a joint in that way with very good workmanship, but not with the work the Company obtain from their men. In most of these cases we found the joint leaky.

Speaking generally, were there many instances in which you found the mains defective before any sewer work had been carried out which could possibly have affected them?—We have found that again and again.

Further examined: In Barton Street and Queen Street the sewer operations were started in mistake, owing to their not knowing the position of the gas-main; and chiefly on account of the condition of the gas-main, they moved their line of sewer. The gas-pipe was found to have dropped; and some of the joints were drawn, and others badly set up. There was considerable leakage from the main, and from one or two services. In excavating, an old sewer was found which witness thought was the cause of the leakage and of the dropping of the main. Following this main along, he only saw small lengths exposed; but there were a number of leaks, as they could tell by the smell. In Argyll Street, the main was composed of short lengths of 3, 4, or 5 feet; so that, instead of four joints as usual in 19 feet, there would be six, and five lengths instead of three. These joints were defective. The soil here was very loose, and seemed as if it was made-ground. There was a great deal of leakage; and, before the contractor had in any way disturbed the gas-pipe, his foreman would not go on working until the Company had sent down to put the pipe in order—so great was the escape of gas. If this main had ever been laid straight, it must have moved or twisted before sewering work started, and must have required re-laying long before any of the sewer work was commenced. At Berwick Road and Castle Foregate, as soon as work was started, and long before the gas-mains were reached, considerable evidences of leakage were found; the men being obliged in some cases to leave the trenches, as the smell was too strong for them. Even the soil was greatly discoloured. Forty loads of pea gravel were removed and deposited in the street. It remained there for some time; and so full of gas was it that it ignited on a match being applied. Witness himself saw that. In the case of the new 15-inch main, the joints of it which he had seen were in the same condition as those he had described on the old mains. At one place, the lead was driven in ¾ inch when the Company were stopping a leak. Witness was then examined in detail in regard to the claim for overhauling and repairing; his evidence being a general denial that there was any foundation for it. He was not aware of the subsidences alleged to have taken place; and generally he asserted that the movement said to have occurred, if it did occur, could not have resulted from the sewerage works. In one case of subsidence, the Company themselves removed the timber from below their pipes.

Cross-examined by Mr. LYTTELTON: All the joints he had seen were defective.

Mr. LYTTELTON: This phrase escaped you: "The joints were defective, but sufficient to contain the gas." Is that accurate?

Witness: Yes.

The UMPIRE: In all cases you said there was a smell of gas where you opened a trench?

Witness: Yes; I think I can say that without exception.

Mr. LYTTELTON: Can you point to a single written complaint or notice that you made of this fact to the Company?

Witness: No.

Do you, or do you not, say that these gas-mains were in bad condition wherever you saw them?—I do say they were in bad condition.

How do you reconcile your opinion with the fact that there was only 5 per cent. leakage before you came there?—Of course, I do not know whether that is the leakage.

Then take it from me that it was?—I am not sufficiently a gas expert to say whether or not that is a considerable leakage. The mains leaked largely and the joints were defective.

Mr. *E. H. Stevenson* said he had inspected the mains of the Company. At St. Mary Street, he saw a 15-inch and a 6-inch main, which appeared to be in good condition; but the lead in the joints of the 15-inch main was, in at least one joint, ¼ inch below the end of the socket, and in another ⅛ inch below the end of the socket. He should not have allowed that if he had been laying the mains. Close to the main at Port Hill (which was only 14 inches deep), he saw large stones. This was certainly not a proper way to lay a main. At Coton Hill, the soil around a 6-inch pipe was heavily charged with gas. At Berwick Road, a 2-inch pipe was joined to a 4-inch one by a 3-inch pipe being inserted in the 4-inch, and the 2-inch in the 3-inch pipe. No proper diminishing piece was used. There the mains had only 15 inches cover. The steel pipe at English Bridge appeared to be in such a form that it was a practical impossibility to make it gas-tight. He did not see how it was possible to caulk a flat joint tight—in fact, the more it was caulked, the less likely it was to be tight, because the instant pressure was put on one point, the pipe would bend inwards and the socket would go outwards. Generally speaking, the pipes were laid at very shallow depths. The charge of the Company for overhauling appeared to be very excessive, even for the amount of damage it was alleged the Corporation had done to the mains. Allowing full prices, £50 should have sufficed for the work claimed for. The claim for gas was improper, because it was based on the selling price—even supposing the loss alleged was the result of the action of the Corporation. The charge to the Corporation should be the actual cost to the Company for the manufacture of the gas. Mr. Belton put it on the average of three years at 17·94d. But the quantity in question would never have required more than two retorts for its production; and in a Company like this, the use of two retorts would be managed without the setting down of a retort of any kind, because a manager could always make a little more or a little less, as required, from the retorts in use. No more retorts, purifiers, or gasholders would have been needed whether the gas claimed for had been made or not; and therefore the same repairs would have been executed upon them as if the gas had not been made. There was a difference in the labour of working the retorts and purifiers, which he allowed for; and also the cost of coal. These items he calculated amounted to 13·5d. per 1000 cubic feet. The Company ought to prove the actual loss from leakage. There was admittedly loss from the new main; yet the Corporation were to be charged with the whole of the loss. According to the returns to Parliament, the proportion of gas not sold to the quantity made was less in 1897 than in the three or four preceding years; yet the Company, in their statement handed to the Corporation, made it out more. The figures, therefore, were not reliable; and it appeared as if the Company did not know exactly where they were. According to a table he put in, the production of gas rose from 10,545 cubic feet per ton in 1896, to 11,034 feet in 1897, and 11,338 feet in 1898; and then it fell. This was a very unusual make per ton. He could not go beyond that; they did not know whether the meter was correct or not. A slight alteration in the retorts would not give this result. The contention regarding the damage to the mains was all surmise. The Corporation could not prove that they had not damaged the mains; and he did not see how the Company could prove that they had. The effect of raising pressure in mains was to cause the quantity passing through any given orifice to increase; double the pressure would increase the escape by about 50 per cent. The increase of pressure in one district would not diminish it in another.

Cross-examined by Mr. LYTTELTON: Is your position this—that a corporation might damage as much as they please a gas company paying maximum dividends?

Witness: Oh, no; I do not take up any legal position whatever. The figure of 13·5d. is based on evidence given by Mr. Belton; but the deduction for repairs and maintenance of works is my figure.

Other things being equal, would not the leakage in 1899 be less proportionately than the leakage in 1880?—Other things being equal, what you say is correct; but we have it in evidence from witnesses that they have never had to attend to the mains—that they never had a bad joint. But mains will not last for ever. The mains are 19 years older; and if they have not been thoroughly overhauled, they must by this time be in bad condition.

Do you say the increase of loss in 1898 is due to the age of the mains and defective joints?—It may be due to the old mains; it may be due to the new mains; it may be due to anything.

In re-examination, witness put in another table showing that the cost of repairs and renewals of mains per 1000 cubic feet of gas sold was not the same from year to year; the figure being 0·93d. in 1893, 1·75d. in 1896, and 1·99d. in 1897.

Mr. WOODALL: If you have a large consumption of gas per mile of main, would you expect a larger or a smaller leakage in proportion?

Witness: I should expect a smaller leakage in proportion to the increase of consumption; but that is under normal conditions.

Mr. *W. C. Eddowes*, Borough Surveyor and Water Engineer at Shrewsbury, gave evidence that whenever he opened the streets he found them full of gas; the defects being in both mains and services. Cases had occurred of water getting in the pipes and stopping them entirely.

Mr. *C. W. Griffiths* said he was employed as Water Inspector by the Corporation. He had worked in Shrewsbury as a plumber for ten years, and had opened water-pipes and connections all through the streets. When the ground was broken up, he generally found a leakage in the gas-mains; and from time to time he had reported these cases to the Company. Whatever the reason, he had found as a fact that gas would come up in the sluice-boxes and fire-plug chambers; and most of the instances he had known could not have been affected by the sewerage operations.

Tuesday, March 6.

Mr. *George Reece* said he acted on behalf of the Corporation through the sewerage contract, as one of their inspectors of works. In December, 1896, when laying the new sewer from the riverside to the Queen Street manhole, excavations were made; and though the gas-main was not exposed, when the level of the main was reached, there was such a considerable escape of gas that the men complained. There was a large quantity of timber left in the trench. In another case, the line of trench was started in error; it being found that the gas-main came into it. He saw, however, that gas was escaping freely; and the main was very irregular. He noticed no settlement in the channel during the whole time. When they opened a trench in Argyll Street, they found the main consisted of odds and ends—pieces ranging from 2½ to 6 feet. The joints were very badly set up. The whole of the timber was left in there.

He saw the Company laying the new 15-inch main; and in his opinion the bed was not sufficient to ensure its safety. The ground was not made up level for the pipe to lay on it; so that the bed did not receive the weight. The ground was strong enough to bear the pipe. The joints were made sufficiently well to stop air, provided they were never moved, but not well enough to stand any strain. He tested some joints in St. Mary Street—the principal street of the town—with a small set and light hammer; and he found the lead only went back ¼ inch. In another instance, the lead went back $\frac{5}{16}$ inch. In many cases the mains were laid so shallow that they would be affected by ordinary traffic; and the services were often so close under the kerb that heavy traffic might easily affect them. Whenever trenches were opened, gas escaped freely.

William Hirst said he worked as a jointer under Mr. Law, the contractor, for two years. He gave corroborative evidence as to the defectiveness of the joints and the leakiness of the mains. In Castle Foregate, before reaching the new main, the men smelt the gas; and so strong was the smell, that the men were taken away from the trench. Witness complained twice that day to the Company; but it was not till the next day that a man came, and then he caulked the joints cold. In three or four joints witness was able to get his knife between the lead and the socket. The 12-inch main in Castle Foregate was leaking so badly that he was unable to bring a light near it. Generally, while working in the trenches, when the gas-mains were not exposed, the men could smell gas. Some soil thrown up opposite the Britannia was set alight by a match, there was so much gas in it; and this was after it had been exposed to the air for a day or two.

John Farley, foreman of works to Mr. Law, said that when working in trenches in Castle Foregate, before exposing the gas-pipes, two or three men, including witness, were made ill by the gas. Several men left Mr. Law because of the smell of the gas in the trenches. The trenches Mr. Law opened were all well-rammed.

Mr. *Stevenson*, replying to a question from Mr. REDMAN, said the cost of distribution, on the average of the three years, was 2·84d. per 1000 cubic feet of gas made.

Frederick Pryce said he had seen the soil discoloured by gas, and had smelt gas very strongly before uncovering the gas-mains.

Joshua Boyce, ganger to Mr. Law, gave confirmatory evidence.

Richard Bywater, employed by the Corporation at the conduit-head, said that for a time after the main to the conduit-head was laid in 1897, sufficient gas was obtained to work the engine; but a short while after they had to relay a portion of the main owing to the defectiveness of the supply. He had had to communicate with the Company many times regarding the pressure. He had seen places in the fields adjoining the conduit-head where the grass was discoloured owing to the escape of gas. He knew that since Feb. 25 last the Company had stripped the main for 200 yards and re-set the joints.

William Bright, a turncock employed by the Corporation, said he had on several occasions called the attention of the Company to leaking gas mains and services he had met with when working at openings. At the bottom of Wild Copse, while he was searching for a pipe, the Gas Company were also looking for one. The Company found a main cut in two, with a wooden plug in one end wrapped round with bagging. The Company searched further, and set a joint on the 15-inch main.

Charles Griffiths, general labourer, said that while working at Coton Crescent, in consequence of a complaint as to an escape of gas, he put a bag of shavings on the road and lit them, with the result that there was an explosion like a gun going off. The Corporation had not been putting sewers in there. At different places between the stones in the road there were little jets of gas which continued burning on being lighted.

This closed the evidence.

Mr. BOSANQUET, in addressing the Court for the Corporation, said the claim consisted of two parts. First, the Company claimed for work done in reinstating gas-mains which they alleged the Corporation had destroyed or injured. This claim was very small. Then the Company claimed—and this was the more important—for the loss they had suffered from consequent escape of gas. In the latter part of 1898, the Company overhauled their mains; and wherever they found any damaged, they made a claim against the Corporation, not only for the repairs, but for the investigation. But if anything was clear in a compensation case, it was that a claim must not be made for investigations undertaken to see if there was a claim. The Company, although they gave notice up to August, 1897, of their intention to open streets and attend to mains alleged to be damaged by sewerage works, did not after that date give any such notice until April, 1899; the overhauling having taken place in the interval, without any representative of the Corporation being present to watch. The case of the Company with regard to the consequential damage was that the Corporation had done them an injury; that the Company made a certain amount of gas; that they sold a certain amount; that the difference was loss; that the loss was greater during the time the sewerage work was going on than previously; and that therefore this extra loss was due to damage done to the mains. In support of this, they said that their gas-mains were in good condition before, and therefore everything that had since taken place was due to the Corporation, because no other cause was apparent. But when the loss by leakage was alleged to be greater, the Company showed a much larger production of gas per ton of coal carbonized than formerly. This they said was due to new furnaces, which would give a better yield; but the bulk of the improvement in the furnaces took place prior to the middle or beginning of 1897—before the sewer work was begun. Then they said the mains were in generally good condition, and there was no reason to suppose they would allow any substantial amount of gas to escape; but was it not marvellous that, having undertaken this overhauling, the Company gave no evidence of public complaints or evidence as to great escapes of gas at the places where the sewer work was alleged to have damaged the mains? There was no evidence of any material escape at any of the places where it was said the sewerage works broke up the mains. The evidence of Mr. Bard showed that the escapes occurred through the joints not being sufficient to keep the gas inside the mains; and the leakage arose long before the Corporation removed any support from the pipes. With regard to Castle Foregate, where it was said a man sank into the ground, the Gas Company were there after the Corporation; so that it was the Company, and certainly not the Corporation, who were responsible. At Conduit Head, beyond any sewerage works, the Company seemed to have put in a new main to supply gas for the engine to pump water. The said they laid it at a time of flood, because the Corporation clamoured for it; and suggested that therefore when it broke down the fault rested with the Corporation. It was also suggested that the Corporation were to be blamed because carts going to the water-works broke the mains as they passed over the road. But the Company should have seen that the mains were laid at a proper depth to resist the carting; and if the carting caused the damage, they had a claim against the man who did it. Certainly that had nothing to do with the sewerage works. As to the gas which was lost, the Company claimed 3s. per 1000 cubic feet, the selling profit price, out of which all shareholders' and debenture holders' dividends had to be paid. But the question was what loss they sustained—not the price which what was lost would have realized. What they had lost was the extra make of gas. This cost was 18d. per 1000 cubic feet; but deductions had to be made for general establishment expenses, which would be the same whether the make was 11 or 12 million feet. The net figure suggested by the Corporation witnesses was 13½d. It would be for the Court to fix the figure—which should be not more than 18d., and not less than 13½d.—to apply to the loss (if any) which they might attribute to the action of the Corporation.

Mr. SPEARMAN said, having heard his friend's speech, he thought he was right in the inference he had drawn that this was an absolutely undefended case—that there was no answer to the claim the Company had made out. The Corporation had not called a single witness to contradict the witnesses for the Company, or to show that there was not this slipping of the soil, or even to show that the trenches were properly filled in. Mr. Bosanquet got hold of a complete mare's nest with regard to the increased production per ton. He seemed to doubt whether there was an increase. There must have been an increase years before it was said to have taken place; and Counsel went on to point out that Mr. Belton, the Company's Manager, attributed the increased production in recent years, not to the furnaces put in from 1892 to 1894, but to those of an improved type which were erected yearly from 1894 onwards. Up to the time the sewerage works were started, the percentage of loss was 5·8; but after that, it sprang up till it became 8 or 9 per cent. There was no ground for disputing these figures, because the earlier ones were prepared year by year, long before the sewerage works were thought of; and there was nothing to throw doubt on the later ones in respect of the years when the works were in operation. The evidence called by the Corporation went to show that long before the works were commenced there was a great escape of gas—that the mains were bad, and that the joints were faulty and leaky. If this were so, how was it that the admitted averages of loss were so good? He suggested that the evidence was unreliable, because if it was true there must have been an enormous escape of gas going on, and the average of loss should have been very much higher than it was. The gentleman who was responsible, in the first instance, for any damage that was done to the gas-pipes was Mr. Law, the Contractor. Why was he not called? He could have stated what really went on in the trenches. The evidence given, if true, only showed that some of the mains were in bad condition; and, if they were in bad condition, this was entirely irreconcilable with the low average loss. On the other hand, whether or not they were in bad condition, there was the startling increase of leakage which occurred at the end of the sewerage operations. The Company said it was due to the works; Mr. Taylor said it was in consequence of the 15-inch main; while Mr. Stevenson would not accept the figures. This was all the evidence. On the question of future damage, the learned Counsel said it was quite true the percentage of loss of gas had fallen somewhat in the past year. But the evidence went to show that, since the Contractor finished, there had been some filling up of holes; that the damage had not yet ceased; and that some leakage was still going on. Figures were quite unnecessary to support a claim for future damage; and all that was done was to put the facts before the tribunal, for them to judge how long that which had been going on over the past three years was likely to continue. In conclusion, Counsel referred to the question of costs. He detailed the steps the Company had taken in formulating and sending in their claim to the Corporation, who met it with an absolute denial of any liability whatever. Therefore the Company were in the position that, if the Court thought they were entitled to anything, they could not get it without the present proceedings. Under these circumstances, he submitted that, there being no offer on the other side—and not only so, but no offer to negotiate for a compromise—if the Company did recover anything, they were entitled to their costs as in the ordinary course. If there was no offer, the claimant, if he had an award, was entitled to his costs under the Lands Clauses Act; and he asked the Court to adopt the same practice here.

Mr. BOSANQUET agreed that the costs were at the discretion of the Arbitrators.

The proceedings then terminated; the award being reserved.

INCANDESCENT GAS LIGHTING AT PLYMOUTH.

Proposed Large Extension of the System.

The Borough Electrical Engineer of Plymouth (Mr. J. H. Rider) has presented to the Electricity and Street Lighting Committee of the Corporation a report recommending the adoption of incandescent gas lighting in all the streets not now lighted on this system or by electric arc lamps. He states that since September last, some 90 incandescent gas-lamps of different types and power have been in use in the streets of the town. Speaking generally, the results have been very satisfactory. The amount of light has been increased, there has been a reduction in the quantity of gas consumed, and the renewals of mantles have been less than was anticipated. Improved lighting in the principal thoroughfares by means of the electric arc lamps and the incandescent gas-lamps has caused great dissatisfaction to be expressed at the comparatively inferior illumination of the other streets. This was only to be expected; and the time, he thinks, has arrived when the lighting of the whole town must be improved. At the end of last year, there were 1924 gas-lamps in use. Of these, 1708 were ordinary lamps of 12-candle power, consuming 4 cubic feet of gas per hour; 21 were of 30-candle power, consuming 10 cubic feet of gas; 84 were of 40-candle power, consuming 13 cubic feet; 9 were of 60-candle power,

consuming 18 cubic feet; and 15 were of 80-candle power, consuming 23 cubic feet. The rest were incandescent lamps—30 of 40 to 50 candle power, consuming 3¾ cubic feet of gas per hour; 39 of 80 to 100 candle power, consuming 4½ cubic feet; 12 of 80 to 100 candle power, consuming 7½ cubic feet; and 6 of 120 to 150 candle power, consuming 11¼ cubic feet. These give a total nominal illuminating power of something like 32,226 candles, at an annual cost of about £2784 for gas alone. He suggests that the whole of the ordinary gas-lamps should be altered to the incandescent system. The totals then will be 1685 of 40 to 50 candle power, consuming 2½ cubic feet of gas per hour; 30 of 40 to 50 candle power, consuming 3¾ cubic feet; 167 of 80 to 100 candle power, consuming 4½ cubic feet; 12 of 80 to 100 candle power, consuming 7½ cubic feet; 24 of 160 to 200 candle power, consuming 9 cubic feet; and 6 of 120 to 150 candle power, consuming 11¼ cubic feet. These would give a total nominal illuminating power of approximately 87,480 candles, at an annual cost of about £2090 for gas, or a saving on the gas account of nearly £700 per annum. To carry out the conversion, Mr. Rider explains that it will be necessary to purchase not only new burners and accessories, but also to fit new lanterns to the posts; the ordinary lanterns not being sufficiently wind and storm proof to shield the mantles. In any case, new ones must be obtained by next September, as those at present in use belong to the Gas Company, and, under the agreement, have to be returned by that date, or a rental paid for them. The capital outlay on new lanterns and burners is estimated at £4000. After allowing the necessary additional maintenance charges, there will be an annual saving of about £300. The interest and sinking fund charges on the outlay of £4000, taken at 3 per cent. and ten years for repayment, will, however, come to £469; so that about £169 will have to be added to the lighting estimates. But for this small sum, the illumination of the gas-lighted streets will be increased by two-and-a-half or three times. The Committee have decided, subject to the approval of the Council, to invite tenders for the burners and lanterns forthwith.

THE SCARCITY AND HIGH PRICE OF COAL FROM A GERMAN POINT OF VIEW.

[From the "Vossische Zeitung" of March 6.]

When, a few weeks ago, an enormous increase took place in the price of coal at Cardiff and in the other coal markets of England, it was given out by the English coalowners that the rise was chiefly due to the fact that the pitmen were winning less coal per head than formerly. We published at the time a declaration by the President of the Union of Miners in Great Britain in which he denied this allegation, and pointed out that if there was a scarcity of coal it was caused by a combination of owners with a view to effecting an artificial rise in price. His words have been verified only too soon by subsequent events. The coal famine has disappeared, and prices have fallen 25 per cent. in London and Cardiff, and rather less elsewhere, without inducing buyers to in any way depart from their attitude of reserve. It may now be assumed with confidence that the market has been "rigged" by the parties interested detaining many thousand trucks loaded with coal in the inland districts—thus causing an extreme scarcity of available trucks—and preferring to pay expensive truck-rent rather than allow supplies to go forward.

The combination of owners appear to have directed their efforts chiefly against two parties—firstly, against two Cardiff dealers who it was said had contracted to export 500,000 tons (some say even 700,000 tons) without sufficiently covering themselves, and who consequently could not supply; and, secondly, against the British Government, with the view of forcing them to pay fancy prices for the coal required for the transports to the Cape. The dealers referred to had to declare themselves unable to fulfil their contracts. The British Government, however, escaped by inviting tenders from Newcastle (instead of buying Cardiff coal at 30s. a ton) for the year's requirements, and also purchased, it is said, a quantity of 40,000 tons of Northumberland coal at 17s. 6d. or 18s. a ton f.o.b.

At the same time American coal came into the market at prices which were 7s. to 8s. per ton lower than Cardiff steam coal, and 3s. to 4s. lower than Newcastle coal delivered at Genoa, Venice, or Trieste. This promptly brought the coal-ring to its bearings. The Welsh collieries threatened to cancel their contracts with the dealers if the latter did not clear off the arrears; and the dealers then found themselves compelled to reduce their prices in a few days from 30s. to 22s. per ton. Of this opportunity the British Government took advantage, and last week concluded contracts with Cardiff for delivery up to the 30th of June at about 22s. 6d. to 23s. per ton. Even this is an unjustifiable price; for on the London market best sea-borne coal has fallen from 28s. to 22s. per ton without in any way inducing buyers to come in. Everyone fears to do more than cover immediate requirements—the end of March being the usual time for the reduced spring prices to come into force. Even the London retail market prices have in the last few days been reduced, which is a very unusual proceeding at the beginning of March.

The weakness of the market was further accentuated by the sudden news that ten miles of rails between Barnsley and London were crowded with laden coal-trucks; so much so that collieries in the Barnsley district were obliged to work short time owing to the scarcity of empty trucks. Of course, this circumstance was attributed to all kinds of causes—to the stormy weather, to the number of railway employees called out to the war, &c., &c.; but not to the most obvious one of an intentional withholding of these quantities of coal from the market. The coal for export from the Humber ports was dealt with in the same manner.

Gradually, however, these enormous quantities of detained coal reached their destination; and this again had a strongly depressing effect on the coal forwarded to the various markets by rail. Thus in the last few days, further reductions of 1s. 6d. to 2s. per ton have taken place both in the North and at Cardiff; so that best Cardiff steam-coal can now be easily obtained for immediate delivery at 20s. to 20s. 6d. per ton.

We do not deny that, of late, Russia, Austria, Germany, and France have made greater demands on England in the matter of coal, and that home requirements have also increased. The withdrawal of workers from the pits, and of employees from the railways, may also have produced some effect. But of an actual scarcity of coal there has never been any question. The scarcity has been entirely an artificial one. The high prices were engineered. We cannot, however, reckon upon a return of low ones. In January, the exported English coal still amounted to only 3,106,484 tons, as compared with 3,117,790 tons in the corresponding month of last year, and only in the last few weeks have the shipments increased. Thus, for example, last week 196,758 tons of coal were shipped from Scottish ports, which is 58,157 tons more than in the corresponding week of 1899; and since the beginning of the year 1,381,388 tons, or 283,366 tons more than last year, have been shipped. These increased shipments are, however, due to the fact that people had recourse to Scotch coal because they could no longer pay the price of English.

MANCHESTER CORPORATION GAS AND WATER SUPPLY.

The Sulphate of Ammonia Plant—The Extra Pipe from Thirlmere.

At the Monthly Meeting of the Manchester City Council last Wednesday, the minutes of the Gas Committee were adopted without discussion. In addition to the recommendations already referred to in the "JOURNAL," they included a resolution asking the Finance Committee to borrow, on the most favourable terms, £25,000 for the erection of sulphate of ammonia works, under the sanction of the Local Government Board dated the 8th of January last. The Committee also recommended the Electricity Committee to pay to the Gas Committee 10s. per cent. for collecting, receiving, and banking the electricity accounts; this suggestion having been made as the result of inquiries as to the methods adopted in other towns.

In moving the adoption of the Water Committee's proceedings, Sir John Harwood, the Chairman of that body, made special reference to a resolution contained therein to the effect that, in the opinion of the Committee, the time had arrived when the question of laying an additional pipe from Thirlmere should receive serious attention, and that the matter should be referred back to the Thirlmere Sub-Committee for the purpose of investigation, with the view of a report on the scheme being presented to the Council. This work, Sir John remarked, would have been proceeded with at once, on account of the large increase in the consumption of water, but for the extraordinary rise in the price of iron pipes. The pipes already laid down cost £240,000. But the expense of an additional pipe-line now would, according to a recent estimate, be £370,000; so that the total estimate of £500,000 would be very largely exceeded. For the pipes to connect Longdendale and Godley, enabling them to utilize the flood water which now escaped, tenders had come in from three of the best-known pipe-makers in England and Scotland; and the lowest was £12,670. It was thought that this connection would be sufficient to meet their requirements until they had made the pipe-line from Thirlmere referred to in the resolution. The Water Committee also requested the Finance Committee to borrow on the water-works account a further sum of £50,000. The minutes of the Committee were passed.

A long list of proposals to advance the salaries of various officials in the Gas, Water, Electricity, and other departments was also on the *agenda*; but it was left over to be dealt with at an adjourned meeting of the Council.

The Honley District Council and the Gas-Works.—A Sub-Committee of the above-named District Council has been appointed to approach the Directors of the Gas Company with the view of ascertaining whether they are willing to part with their undertaking to the Corporation.

Reductions in Price.—The Weston-super-Mare Gas Company have decided to reduce the price of gas by 2d. per 1000 cubic feet as from Jan. 1 last. It was announced, at the last meeting of the Uxbridge District Council, that the Gas Company had reduced the price of gas from 3s. 11d. to 3s. 6d. for lighting purposes only.

The Heckmondwike District Council and the Gas-Works.—The Heckmondwike District Council have resolved to approach the Liversedge District Council with a view to discussing the desirability of purchasing the local gas-works. These, which are situated within the Liversedge Council's area, supply both Heckmondwike and Liversedge; and abortive attempts have been previously made to acquire the property.

The Price of Gas and Workmen's Hours and Wages at Morley.—At a meeting of the Morley Town Council on Monday last week, it was resolved to advance the price of gas from 2s. 4d. to 2s. 7d. per 1000 cubic feet. The Gas Committee reported that they had had an interview with the stokers employed at the works with regard to a demand for the following concessions: (1) Eight hours a day, (2) extra men to work low fires, (3) 5s. 3d. per shift, and (4) double pay for Christmas Day and Good Friday. The question had been settled by re-arranging the hours of employment, and offering the men 5s. 3d. per shift of eight hours and double pay for Christmas Day and Good Friday.

A Gas-Works Offered for Sale by Auction.—At the Auction Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards offered for sale a property of a kind which does not often come "under the hammer." This was the freehold gas-works at Bagshot, Surrey, consisting of a retort-house and coal-store, condenser, tar and liquor well, purifier-house, two gasholders, governor-house, and mains to a total length of about 3700 yards—the whole to be sold as a going concern. The profits from the works had been estimated to amount to £310 per annum. Before the bidding commenced, Mr. W. A. Schultz, the Secretary of the Ascot District Gas Company, drew attention to the fact that the works were situated within the district of his Company. The Auctioneer replied that there was no doubt at all that the Ascot Gas Company had power, under their Act of Parliament, to extend their mains through the locality supplied by the Bagshot works; but the former proprietor of the works always considered it so unlikely they would do so, that he had not thought it worth while to oppose the application of the Ascot Gas Company for their Act. The bidding started at £1200, and finally reached £2250, at which figure it ceased. The Auctioneer thereupon announced that, as the expert who had been called in valued the undertaking at £4500, this was the reserve price put upon it. The property was therefore withdrawn.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The 69th ordinary general meeting of the Bognor Gas Company was held last Tuesday, when the Directors' report showed a net balance of £1175 for the six months ending Dec. 31. They recommended that a dividend be declared of 5¼ per cent. for the half year on the original shares, and of 3¾ per cent. upon the new shares; making 10½ and 7½ per cent. respectively for the year. These dividends would amount to £606; leaving a balance of £569 to the credit of the profit and loss account. The report was adopted.

At the half-yearly meeting of the Cheltenham Gas Company last Thursday, the Chairman (Mr. R. Ticehurst), in moving the adoption of the report, noticed in the "JOURNAL" for the 27th ult., stated that the receipts from residuals were £3800 more than in the preceding year. On the other hand, the cost of coal was £4272 greater. A reserve stock of 7000 tons had tided the Company over the difficult season just before and after Christmas. The number of cooking-stoves on hire was 3375, being an increase of 728 during the year. The "Cheltenham" cooker was very popular—no less than 2465 of the stoves in use being of this make; and 753 were fitted with coin meters. The report was adopted.

At the annual meeting of the Dartmouth Gas Company last week, the Directors reported that new purifying plant had been erected at a cost of £825, of which £700 had been raised by debentures at 3½ per cent., and the remainder paid out of revenue. The receipts amounted to £3769, and the expenditure to £3263. A dividend of 13s. per share, equal to 10 per cent., was declared. The Chairman (Dr. R. W. Soper) said that a very favourable coal contract for some part of the year enabled them to keep the gas-rate at the old figure; but if the high price of coal continued, the Directors would have to seriously consider whether the charge for gas should not be raised. Mr. J. Bartlett complimented the Manager (Mr. J. Tall) upon erecting the new plant without the services of an engineer. The Manager said it would more than pay for itself by the saving effected in material and labour. The Directors would soon have to look into the question of whether they should not supply prepayment meters, which would bring in a class of customers now consuming oil.

The half-yearly meeting of the Hastings and St. Leonards Gas Company was held on the 1st inst.—Dr. G. G. Gray in the chair. In their report, the Directors stated that in the six months ending Dec. 31 there had been the very satisfactory increase of more than 15 million cubic feet, or nearly 8 per cent., on the quantity of gas sold, as compared with the corresponding half of 1898. Of course, trouble had been experienced with the coal supplies; and had it not been for the large quantities stored during the summer, serious inconvenience must have resulted. On the other hand, residuals had improved in value. The accounts accompanying the report showed that £32,165 had been received for gas and £7406 for residuals—the total receipts being £41,889. The expenditure was £30,209 (including £16,831 for coal and oil and £1862 for coal duty paid to the Corporation); so that there was a sum of £11,680 to go to the profit and loss account. The amount available for distribution was £51,967; and the Directors recommended the declaration of the statutory dividends. Under the supervision of Mr. Charles E. Botley, M.Inst.C.E., the Company's Engineer and Manager, 15,522 tons of Newcastle coal, 123 tons of cannel, and 147,101 gallons of oil were used in the production of 212,949,000 cubic feet of gas (including 53,999,000 cubic feet of oil gas), of which 207,588,100 cubic feet were sold and 209,717,500 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 9696 tons; breeze, 759 tons; tar, 156,045 gallons; and ammoniacal liquor, 251,579 gallons. The Chairman, in moving the adoption of the report, said it was again his pleasure to congratulate the shareholders upon the very satisfactory half-year's working—he might say the satisfactory year's working, because, though the present was the first half of the financial year, it was the second half of the calendar year 1899. The report drew attention to the fact that there had been upwards of 15 million cubic feet more gas manufactured in the past six months. Putting this into pounds, shillings, and pence, it meant a rise of £2351 in the receipts for gas sold. In addition to this, there had been improvements under other heads; making an increase on the receipts side of £3241. On the expenditure side, there had been an advance in the cost of coals, carriage, wages, and rates and taxes. However, there was a profit balance of £11,680. The increase was not large; but, having regard to all the circumstances, it was satisfactory. The report referred to the great difficulty experienced during the winter in securing the necessary deliveries of coal; and he might add that it had been very great, when it was considered that the quantity of gas which now had to be made had reached upwards of 400 million cubic feet per annum. At times coal and labour could hardly be obtained for love or money; and Mr. Botley was to be congratulated that he had been able to help some of his brethren with coal. It had been a time of great anxiety. An issue of further capital would shortly be necessary, due to the natural increase of the Company's business; but he thought about £10,000 would be sufficient. Alderman Bray, in seconding the motion, congratulated Mr. Botley upon his successful work, and expressed his sympathy with him in the trying time through which he had passed. Mr. Oke, in supporting the motion, spoke in the highest possible terms of the management and present position of the Company. With regard to the coal question, he said he knew of two cases where gas companies had no coal at one time; and therefore it was satisfactory and gratifying to see that their own Engineer had been careful to get in a sufficient stock, and had realized that it was a mistake not to keep it up. The report was adopted.

The annual meeting of the Honley Gas Company was held on the 1st inst.—Mr. E. Crowther, the Chairman, presiding. In moving the adoption of the report and accounts, he said the shareholders would notice that more gas had been made and sold last year than in the previous twelve months, notwithstanding the fact that nearly all the mills had electric lighting installations of their own. More coke per ton of coal carbonized had also been sold. Discounts were considerably more, on account of extra discounts having been allowed for all gas used for cooking and lighting purposes. The net price for cooking was 2s. 3½d., and for lighting 3s. 5½d. per 1000 cubic feet. These prices would compare favourably with those charged in many towns of similar size. Another matter to which he would like to call their attention was the leakage. The Manager (Mr. J. Baldwin) had doggedly persisted in reducing it, and with much success. Some few years ago, it was more than 22 per cent.; last year it stood at a record point—viz., 6·17 per cent. The Directors considered this very satisfactory indeed. The report was adopted; and the payment of the usual dividend of 7½ per cent. per annum was sanctioned. Votes of thanks were accorded to the Chairman and Manager.

Mr. T. D. Wivell presided at the annual meeting of the Ilfracombe Gas Company, which was held last Wednesday. In their report, the Directors stated that, after carrying £200 to the reserve fund, the profit and loss account showed an available balance of £1809, from which amount the Directors recommended payment of the statutory dividends of 5 per cent. on the preference and consolidated ordinary stock. During the year the business had continued to progress satisfactorily. The greater portion of the increase in the make of gas occurred in the Midsummer and Michaelmas quarters, which was proof that gas was becoming popular for cooking purposes. No further extensions had been made at the Hele works, and no heavy expenditure for plant was anticipated during the current year; the Directors considering it advisable to defer every addition possible until the price of iron receded. The contracts entered into in June last for the supply of coal were happily favourable. The Chairman, in moving the adoption of the report, said that though the demand for coal had led to a great advance in the price, the Directors did not intend to increase the charge for gas unless coal became much dearer than they now anticipated. The gas consumed in the public lamps and buildings did not appear to be more than in former years; but the domestic consumption was augmenting, and they anticipated a still greater demand for cooking purposes. With regard to the electric light, the Company had been in negotiation with the District Council on the matter. The latter asked upon what terms the Company would take over the Provisional Order; and the terms given were generally considered the best the Council had received. On the 3rd of January, however, the Directors had a letter from the Clerk to the Council which stated that they had decided to defer the consideration of the Company's application *sine die*. He thought this was a very curt reply, after they had been asked to quote terms and had incurred certain expense. If the Council decided to undertake the supply of electricity to the town, the Directors would not have a word to say against it; but if they handed over the Order to any other company after the negotiations which had taken place, he believed the ratepayers would not consider it businesslike or in their interest. Mr. H. A. Willey seconded the motion; and it was unanimously carried. The dividends recommended were declared, and the thanks of the meeting were accorded to the Directors, Manager, and officials.

At the recent annual general meeting of the King's Lynn Gas Company, the Chairman (Mr. W. Burkitt), in moving the adoption of the report, in which the Directors recommended a dividend of 10 per cent., leaving a balance of £292, said the total revenue for the past year was £14,501, against £13,301 in 1898—an increase of £1200; while the expenditure was £10,293, against £9422, or £871 more. The extra cost of coal accounted for £668; and the remainder was money spent on repairs to mains and legal expenses. The coals carbonized amounted to 7430 tons, against 7198 tons in 1898—an increase of 330 tons; so that they had not suffered much from the electric light at present. The gas from 200 tons of coal had been entirely lost to the Company owing to the breakage of mains in connection with the sewerage and other works; and even with this loss they were able to declare their old dividend. A growing and important item was the revenue from slot meters. In 1898 the receipts from this source amounted to £12. Last year they had 165 meters, which brought in a revenue of £194; and the increase for the past six months had been £155. Mr. Pridgeon seconded the motion. Mr. Coulton stated that the Company had received some compensation from the Corporation for the damage sustained by the mains and the consequent loss of gas. The report was adopted, and the dividend recommended declared.

The half-yearly meeting of the Lewes Gas Company was held last Wednesday—Mr. J. Broad in the chair. The Directors reported that there was a profit of £1960 on the revenue account. After providing for interest on mortgages, the balance of net revenue was £2910; and the Directors recommended that a dividend for the half year be declared of 5 per cent. upon the consolidated original capital stock and of 3½ per cent. upon the additional capital stock. These dividends (after deduction of income-tax) would amount to £1434, and leave £1476 to be carried forward. In moving the adoption of the report, the Chairman said the Directors considered it a very satisfactory one. The receipts had increased, more especially in regard to the rental of meters and stoves; thereby showing that the public were appreciating gas for heating and cooking purposes. The receipts for residuals were greater; and it naturally followed on the high price of raw materials that they had to deal with. The expenditure had been heavier; but the Directors considered that when they were doing well was the time to maintain and consolidate their property, and they had accordingly spent a good deal of money on repairs. They would have to do the same, he thought, in the present year; and he hoped they would be in a position to do so, notwithstanding the high price of coals they had to face. Their contract would run out in a few weeks' time; and he trusted they might be able to enter into another at such a price as would enable them to continue the present low charge for gas. Alderman Kemp seconded the motion. Mr. A. W. Oke, in supporting it, remarked that one of the most satisfactory things in connection with the Company was the fact that they had had such an excellent contract for coal. This had enabled them to tide over a very serious time. On the 31st of December they had a large amount in stock, whereas other companies had been living from hand to mouth. The fact that coal had gone up in value had been compensated for, to some extent, by the increase in the returns from residuals. When they had to renew their coal contract, it would be gratifying to feel that, though the price they paid for their raw material would probably be a great deal higher than it had been, it would ultimately benefit gas companies. As a matter of fact, at Eastbourne, Hastings, Brighton, Bournemouth, and many other places, the increase in the sale of gas had been very large during the past half year. At Bournemouth, it was quite 20 per cent.; and this showed that, when coal was dear, people took the opportunity of using more gas. They felt that, while coal might rise suddenly in price, gas could not go up proportionately until the coal

market had been high for some time, because the companies failed to raise their prices; and if they obtained more consumers, he thought the Manager would bear him out in saying that people who commenced to use gas rarely gave it up. Another point worthy of mention was the extending use of prepayment meters; and he had no doubt the substantial increase in the receipts for gas was partly due to them. The report was adopted, and the dividends recommended were declared. A vote of thanks was accorded to the Chairman and Directors, which was acknowledged by the former, who thanked the Secretary (Mr. H. J. Hillman), the Manager (Mr. Levi Monk), and the staff generally, for the admirable manner in which they had carried out their duties. The two officers named briefly returned thanks, and the meeting terminated.

The annual meeting of the Lichfield Gas Company was held last Tuesday, when the Directors reported that the business of the Company was in a satisfactory condition. The usual dividends were declared. A vote of thanks was passed to the Chairman, and appreciation was expressed at the exertions of the new Manager (Mr. F. Key). After the meeting, several of the Directors and shareholders inspected the new show-room and offices recently added to the Company's premises, and much praise was given to the new arrangements.

The 24th annual general meeting of the Londonderry Gas Company was held on Friday, the 2nd inst.—Mr. W. Tillie in the chair. The Secretary (Mr. J. Macnie) having read the notice convening the meeting, the report and accounts were presented. The latter showed that the revenue from the sale of gas last year (82,593,000 cubic feet for ordinary consumption and 4,558,000 cubic feet for public lighting) was £13,993; and from the disposal of residual products, £3523—the total receipts being £18,058. The expenditure amounted to £13,768 (coals costing £8403); so that a sum of £4290 was carried to the profit and loss account, the balance on which was £18,761. Out of this, the Directors recommended the declaration of a dividend at the rate of 11 per cent. The consumption of gas increased last year beyond their expectation; but the cost of production was much higher, owing to advances in price of coal and all other materials. Taking these matters into consideration, they felt it necessary to revert to the price charged for gas previous to last year. The valuation of the Company's property was raised during the year to the extent of £327, which adds about £110 yearly to the expenses. The Chairman, in moving the adoption of the report, expressed his pleasure that the business of the Company was in a healthy and prosperous state. He said he had no doubt that, though they were working under great difficulties at present on account of the high price of coal and other materials, they would be able to surmount them, and make the concern as successful as it had ever been. They were menaced with the private lighting of the city by electricity; but he did not fear that this would be disastrous to their interests. In Londonderry there were great opportunities of increasing the consumption of gas for cooking, heating, and motive power. The laundries also were rapidly extending, and were dependent upon gas far more than upon electric light. He therefore had the greatest confidence that, even if the private lighting scheme was carried out, they would still be able to conduct their business successfully. The motion was unanimously passed. A vote of thanks having been accorded to the Chairman, Directors, Secretary, and staff, it was acknowledged by Mr. Tillie and Mr. Macnie, and the proceedings closed.

At the recent annual meeting of the Maldon (Essex) Gas Company, the Directors reported a satisfactory increase in the net profit, notwithstanding the reduction which had been made in the price of gas; and they recommended a dividend of 7½ per cent. The revenue account showed a profit of £923. The balance on the net revenue account at the close of the year amounted to £3150. Of the latter sum, £1353 was expended on capital account; leaving a balance of £1797 from which the dividend could be paid. Mr. W. K. Digby moved the adoption of the report. The motion was carried unanimously.

The half-yearly meeting of the Salisbury Gas Company was held on the 28th ult.—Mr. G. Fullford (Chairman of the Company) presiding. After the minutes of the previous meeting had been read and confirmed, the Chairman moved the adoption of the accounts and the payment of the usual dividends on the various classes of shares, ranging from 5 to 10 per cent. per annum. He explained the items in the accounts, and said that fortunately the Company's contract for twelve months' supply of coal was entered into in June last. At that time they had to pay a higher price; but he hoped before the next four months had expired they would find their staple commodity back to ordinary figures. As to the sales of gas, he believed for the year they would be fully up to the average. Mr. W. Young seconded the motion, which was carried unanimously. Mr. A. Watson said the thanks of the shareholders were due to the Chairman, Directors, and officers of the Company for their services during the past six months. He therefore proposed a vote of thanks to these gentlemen. Mr. C. Fullford seconded the proposition, and it was carried. The Chairman, in returning thanks, said they had the management of an important local industry, which contributed £500 per annum to the rating, and paid a weekly wages bill of £60. He desired to acknowledge the services of the officers of the Company and of their staff of workmen.

At the annual meeting of the Shotley Bridge and Consett Gas Company last Friday, a profit of £2307 was reported. It was announced that a new gasholder and tank (which would cost £7000) would be completed six months hence; and it was intended to create new stock to meet the cost. A dividend of 5 per cent. was declared.

At the half-yearly meeting of the Sutton (Surrey) Gas Company—Mr. Budgen presiding—the Directors reported that the past six months had been a period of prosperity. The increase in the Company's business had been unprecedented; the production of gas having advanced 15¼ per cent. over the corresponding half of 1898. Much of this was due to the growth of the district; but it was chiefly attributable to the large number of gas heating-stoves, and to the spread in popularity of the system of supply by slot meters. The gross revenue was £1600 more than in the latter half of 1898. The balance available for distribution was £7969; and the Directors recommended the payment of dividends at the rates of 10 and 7 per cent. per annum on the original and additional shares. The Chairman, in moving the adoption of the report, remarked that although the revenue had increased by upwards of £1600, their expenditure was £1695 greater. The supply of coal had been a matter of considerable anxiety to the Directors, as he thought it had been to all conductors of gas undertakings. They were fortunate in having obtained their coals in sufficient quantity to keep up the supply of gas, though they had done more business. During the half year, the consumers had increased from 1460 to 1540; cooking-stoves, which were an important factor in the business, from 345 to 366; and heating-stoves, from 58 to 95. Of slot meters, which were an entirely new departure, they had 287. This was a business which he thought might be satisfactorily cultivated, because even if they had to compete with electricity they believed the use of gas heating and cooking stoves would continue to extend. The report was adopted; and the dividends recommended were declared.

The 34th annual meeting of the Tynemouth Gas Company was held last Thursday, when the Chairman (Mr. J. B. Williamson) moved the adoption of the report and accounts, noticed in the "Journal" last week. In doing so, he said the Company had had an unusually successful year. Their coals had been reasonable in price, owing to the favourable contract they succeeded in making. Residuals had given good results, and the staff and men had done excellent work, which was reflected in the increased revenue obtained from each ton of coal carbonized. Having referred to the trouble of unaccounted-for gas, he said the percentage of loss had been reduced from 9·23 to 6·7. Many of the large mains had been renewed during the year—a considerable share of the cost being borne by revenue, and only a fair proportion being charged to capital. The result had been that they were able to face without undue alarm a great advance in the price of coal; and should the high prices now ruling be not too long maintained, the Directors hoped no serious advance in the charge for gas might be necessary, if indeed it should be required at all. After paying the interest on the debentures, and providing for the full dividend, they were able to add £3065 surplus profit on the year's working to the balance brought from last year, and were thus able to carry the substantial sum of £4044 to the reserve fund, which now stood at the maximum. Having alluded to the increasing popularity of slot meters, he said the improvements in the retort-house continued to give good results. The new works had been fairly commenced; and it was expected they would be ready for making gas by the latter part of next year. Great attention had been given by the Engineers to ensure that only the most approved and economical methods were adopted; and the Directors were satisfied that these works would be of a model kind, both in efficiency and economy. Death, they regretted, had removed one of their very old servants, in the person of Mr. W. B. Davidson, who had been connected with the Company for 43 years. The report was adopted, and a dividend of 2½ per cent. for the past six months was declared, making with the interim dividend 5 per cent. for the year.

At the recent annual meeting of the Wellington (Salop) Gas Company, the Chairman (Mr. Harry Shepard) gave an interesting account of the past year's working; alluding to the new retorts which had replaced the old ones, and the arrangements made for erecting a new gasholder. He said that there were now 400 slot meters in use, and the number was steadily augmenting. Several gas-engines had lately been put down for manufacturing purposes; and these also were on the increase. The reduction in the price of gas had been happily met by an increased demand; and when the new holder and other projected improvements had been carried out, the shareholders would be possessed of one of the best equipped and most up-to date gas-works in the Midlands. A dividend at the rate of 10 per cent. per annum was declared on the original shares of the Company for the six months ending the 31st of December, and one at the rate of 5 per cent. per annum on the new shares, both free of income-tax. The retiring Directors and Auditors were re-elected. At the close of the business, a vote of thanks was passed to the Directors, and also to the Engineer and Manager (Mr. Herman Taplay), for the able and careful way in which he had carried on the works and extensions.

At the recent annual meeting of the Weston-super-Mare Gas Company, the report submitted by the Directors recommended the statutory dividends, and also a reduction in the price of gas to private consumers, as from Jan. 1, of 2d. per 1000 cubic feet. The balance-sheet showed that during the year 100,894,950 cubic feet of gas had been sold (including 12,357,950 feet for public lighting and under contracts), producing a net revenue of £15,466, after allowing £1239 as discount to consumers. The rental of meters brought in £588, and the residual products £3441, which, with transfer fees, brought up the total income to £19,497. After defraying cost of manufacture, distribution, management, &c., £3721 was the balance carried forward to the profit and loss account.

Water Company.

The 35th ordinary general meeting of the Woking Water and Gas Company was held last Tuesday, at the offices, Great Winchester Street, E.C.—Mr. Charles Horsley in the chair. The Directors reported a balance of £2843 at the credit of the profit and loss account, out of which they recommended the payment of a dividend at the rate of 4½ per cent. per annum for the six months ending Dec. 31, less income-tax, which would absorb £1806, and that the balance of the preliminary expenses, amounting to £575, should be written off; leaving £462 to be carried forward. They stated that the expenses for the half year had been abnormally heavy, owing to the exceptional drought, necessitating increased pumping, and causing a large additional outlay for coal, labour, maintenance, and distribution. In moving the adoption of the report, the Chairman reminded the shareholders that the Company had obtained their Act, and had gone on with the preparation of the plans, &c., for the extensions, though money was so dear a short time ago that they did not think it advisable to issue any further capital then. They would want more water very soon, and they were authorized to get it from the Thames; but they could not do this without a great deal of expense, as they had a long way to convey it. The Directors would want the shareholders and their outside friends to take shares to a large amount, because the Thames was five or six miles distant from the Company's district, and they had the ground to buy and the Act of Parliament to pay for. It would be seen by the report and accounts that the Company were doing better. In view of the works rendered necessary in order to provide a further supply of water, they proposed to issue £20,000 of additional capital. The profits showed a slight decrease of £258; but this was in consequence of the high prices of coal, labour, &c., during the past year. The Directors saw their way to keeping up the dividend to 4½ per cent.; at any rate, he did not think it would go down. Sir John Baker seconded the motion. Replying to questions, the Chairman stated that their pumping was yielding a good supply. Recently, there had been

more than enough water, and the Company were able to assist Guildford; but they did not propose to do this except in cases of emergency. Mr. C. E. Jones asked how many gallons of water per head was supplied. The Chairman said he did not wish to state the exact figure, but it was under 20 gallons. The Engineer (Mr. J. Quick) said the supply per head would compare favourably with that of any other Company in the kingdom. The report and accounts were then adopted; and the dividend of 4½ per cent. was formally declared. Subsequently the Directors were authorized to issue additional capital to the amount named above, and to raise £5000 on loan; and the proceedings closed.

AUSTRALIAN GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held at the Head Office, Sydney (N.S.W.), on Monday, Jan. 29—Mr. G. J. Cohen, the Chairman, presiding over a large gathering of shareholders.

The Secretary (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was taken as read. In the course thereof, they stated that the profits for the six months ending Dec. 31 last amounted, with the balance brought forward, to £57,934. They recommended the payment of a dividend for the six months of 9s. per share, free of income-tax, which would absorb £51,135; leaving a balance of £6799 to be carried forward. The Engineer (Mr. T. J. Bush, M.Inst.C.E.) reported that the whole of the plant was in good condition. As the result of his visit to England, the Directors had decided to erect carburetted water-gas plant at their Head and Mortlake stations; and they expected to have it in full operation by September next. A contract had been entered into for ten years with the New South Wales Shale and Oil Company, Limited, to supply the oil required. In the course of the half year, 1130 slot meters had been fixed; making the total number in use 4130.

The Chairman, in moving the adoption of the report, said he was pleased to inform the shareholders that the undertaking was still prospering; the past half-year's operations having been very satisfactory. The prepayment meter consumers were increasing at the rate of 50 per week, the number of slot meters now in use being, as mentioned in the report, 4130. The extra consumption of gas by this new class of consumers for the past twelve months had reached 20 million cubic feet. With the view of keeping abreast of the times, and on the recommendation of their Engineer, the Directors had ordered from Messrs. Humphreys and Glasgow two sets of carburetted water-gas plant, each to manufacture 500,000 cubic feet of gas daily; and they should be in working order by September next. The Company had arranged to take the oil required in connection with this system of gas manufacture from the New South Wales Shale and Oil Company. The oil could now be obtained a little cheaper if imported; but, in view of a duty being imposed when federation took place, the Company, on the whole, would do better with local oil, and, in addition, would be supporting a local industry. He could not yet say what effect the Early Closing Act would have upon the consumption of gas. At present, the increase, which had been going on during the past six months, had not only been maintained, but exceeded. It would, however, probably have been greater had the Act not been passed. Comparing the Company's position with that of twenty years ago, he found that in 1880 the revenue was £140,000, against £300,000 now. The price of gas then was from 7s. to 10s. per 1000 cubic feet; whereas now it was only 4s. The sale of gas had increased from 355,233,000 to 1,373,560,000 cubic feet; the number of consumers from 9000 to 41,000; the public lights from 2738 to 10,250; and the amount paid in dividends from £37,491 to £102,270 per annum. The number of gas-cookers sold during the past year was 705; making a total of more than 9000 now in use.

The Deputy-Chairman (Mr. S. Dickinson) seconded the motion; and it was carried unanimously.

GAS, WATER, AND GENERAL INVESTMENT TRUST, LIMITED.

The Annual General Meeting of this Trust was held last Tuesday—Mr. J. B. Braithwaite in the chair. The Directors' report stated that after debiting revenue account with interest on debenture stock and all expenses, and crediting it with the sum of £3342 brought forward from last account, there remained a balance of £23,595, out of which an interim dividend was paid for the half year to July 28 last, at the rate of 4½ per cent. per annum on the preferred stock, amounting to £7308. The Directors now recommended further dividends at the rate of 4½ per cent. per annum on the preferred stock, and at the rate of 4 per cent. per annum on the deferred stock, for the six months to Jan. 28 last; making for the year 4½ per cent. on the preferred stock and 2 per cent. on the deferred stock. This would absorb £18,946 for the year, and leave a balance of £4649 to be carried forward. After deducting from the profits on sales the loss made on certain changes of investments, there remained a balance of £3812, which had been placed to the credit of suspense account for the adjustment of securities; and after debiting the amounts written off the cost of several of the securities during the year, there was a debit at this account of £98,852. The securities stand in the books at cost prices, less £105,704 written off out of realized profits, and the £98,852 placed to suspense account. Many of the securities held are still in default, and much depreciated in value; and so far as the Directors are able to judge, further provision will ultimately have to be made. The Trust, however, hold securities to a considerable amount, which have been received in lieu of interest, and for which no credit has been taken in the accounts. Cash received from sales of these securities would be available for revenue. The Chairman, in moving the adoption of the report, said the claims of the deferred shareholders were not being overlooked by the Board; and they were hoping that circumstances this year would be such as to enable them to make a larger increase in the dividend on this stock than on the present occasion. In time, they might even feel justified in recommending interim dividends on the deferred stock. They had still got a somewhat uphill fight before them, to bring the Trust into what could be described as a thoroughly satisfactory condition; but they were making steady progress in this direction. They had continued to follow the policy of providing for all losses as soon as ascertainable; and the result was that they had written down their investments by £41,330. On the other hand, they had made a profit on securities realized of £11,486—nearly three times the amount of the previous year. Against this, they had incurred a loss on securities realized of £7674, which left them with a balance on the right side of between £3000 and £4000. The most important event during the year had been the completion of arrangements by which the affairs of the Union Light and Power Company (in which the Trust had a very large interest) were placed on a thoroughly sound basis. The various interests of that Company had now been amalgamated under the title of the Utah Light and Power Company; and he (the Chairman) held the opinion that this security would likely be in the future a very valuable one to the Trust. The Trust had also extensive holdings for which no value was taken in the balance-sheet. One of the most important of these was their investment in the Kenilworth Sugar Estates. These estates had done very well indeed during the past year; and the Board were looking forward to much better results. After a short discussion, the report was adopted, and the dividends recommended were declared.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week at the Albion Tavern, Aldersgate Street, E.C.—Mr. Charles Horsley, J.P., presiding.

The Engineer and Secretary (Mr. J. L. Chapman) read the notice convening the meeting; and the report and accounts were then submitted.

The Chairman said his first words must be of regret at the absence of their Chairman (Mr. James Glaisher). Mr. Glaisher had been very ill; but he (Mr. Horsley) was exceedingly pleased to learn that he was now getting rapidly well. He did not think their Chairman had been absent from the meetings more than once or twice during the long course of years that he had been connected with the Company. Turning to the report and accounts, he thought the shareholders would agree that the past half year had been a prosperous one. The gas-rental, which amounted to £7359, showed an increase of £529, compared with the corresponding period of 1898. This was equal to 7¾ per cent. But taking the different districts which constituted their area of supply, he found that in the Harrow district the increase of rental was equal to 6¼ per cent., in the Sudbury and Harrow Weald district 11½ per cent., and in the Stanmore district 9½ per cent. The public lighting, too, gave them an increase of 6¾ per cent. The meter and stove rental had also increased; and the receipts for residuals had moved upwards. The coke receipts had no doubt improved owing to the higher price of coal; the increased income from coke and the other residuals being £206. The total receipts amounted to £9087, which was an increase of £782 compared with the December half of 1898. This he regarded as very good. The expenditure for the half year was £6198, or an increase of £484. The item of coal had necessarily advanced, mainly because the output of gas had been larger. As to repairs and maintenance, £137 more had been spent on the works, and £118 more on the mains. Then £200 had been written off the suspense account, which was a very proper thing to do. The profit for the half year was £2888, which was an increase of £297 compared with the second half of 1898. The dividend and loan interest required £2757; so that there was a surplus on the year of £130 to carry forward to the balance, which now amounted to £819. The quantity of coal gas made during the half year was 29,817,000 cubic feet, and of oil gas 8,467,000 cubic feet—making together a total of 38,284,000 feet. The quantity of gas sold was 33,912,000 cubic feet, used on works 530,000 feet, and unaccounted for 3,842,000 feet. This last figure represented slightly over 10 per cent.; but for the whole year, it was 8·15 per cent. He was not going into the reasons for the unaccounted-for gas being 10 per cent.; but there were several things which had assisted in swelling the amount. The water-gas plant had been established and was working; and he thought it would do even better than it had done in a few months' time. He moved that the report and accounts be adopted.

Mr. A. H. Baynes seconded the motion.

Mr. D. Hill said the capital seemed to be very much in excess of the amount of business done. He believed that the capital should average between £500 and £750 per million cubic feet; but in this Company it was considerably above that. He should like to know whether the Directors had taken up the slot-meter system. He was a Director of the Watford Gas Company; and they found these meters a vast help. They had nearly 1000 penny-in-the-slot meters, and were adding about twenty per month. Shilling-in-the-slot meters had also been found useful where they were at all uncertain as to a consumer's financial position. In the past twelve months, the amount collected from the penny-in-the-slot meters was about £2070. The consumption per slot meter was about 10,700 cubic feet in twelve months. The Company's own men did the work; and the Company found everything, including a stove—the cost per house averaging about £7.

The Chairman replied that the Harrow Company also supplied both shilling and penny in the slot meters; but he fancied the Watford district was totally different from their own. He believed that at Watford there were a great many more of the class of resident who would consume gas on the slot system. Regarding the capital, it must be remembered that they had bought up the Harrow and Stanmore Companies; and works could not be shut down, and new trunk mains laid, without increasing the capital.

The motion was unanimously carried.

Dividends at the rates of 8, 7, £5 12s., and 6 per cent. per annum on the various classes of capital were next declared.

The retiring Directors (Mr. Charles Horsley and Dr. J. W. L. Glaisher) were next re-elected.

Both gentlemen acknowledged the confidence of the shareholders; Dr. Glaisher remarking that his father was extremely well pleased with the balance-sheet on this occasion, and thought it was one of the best ever submitted to the shareholders.

On the motion of Mr. Charles Gandon, seconded by Mr. Frederick Lennard, Mr. Horace J. Rydon was re-appointed an Auditor.

Mr. CHAPMAN, responding to a vote of thanks to himself and his staff, remarked that he was very pleased to hear that Mr. Glaisher considered the balance-sheet a good one. With regard to the water-gas plant, they had a few difficulties in starting it; but it was running all right now. The price of coke was a very important factor with them in connection with the manufacture of water gas. In Harrow they had only a certain demand for coke. When that demand was overcome as it were, the surplus had to go to London; and the cost of carriage and transport swallowed a very large portion of the receipts. Therefore, they now used the water-gas plant to keep the coke down to the normal. By carefully adjusting to their circumstances the use of the coal and water gas plants, the latter would add very much to the profit of the Company.

Mr. A. F. PHILLIPS asked to be allowed to inquire of Mr. Hill how much the prepayment consumers of Watford had to pay in excess of the ordinary consumers.

Mr. HILL answered that the ordinary price was 2s. 10d., and the prepayment consumers paid 4s. The amount of gas given for a penny was 21 cubic feet. The money received from the extra charge was utilized for the repayment of capital and depreciation.

Mr. PHILLIPS remarked that, in being able to charge as much as 1s. 2d. per 1000 cubic feet extra, the Watford Company were evidently doing a good business. They would not be able to charge so much in Harrow. He proceeded to move a vote of thanks to the Chairman and Directors, and expressed the regret of the shareholders at the cause of the absence of Mr. Glaisher.

Mr. LENNARD seconded the motion, which was heartily agreed to.

A brief response by the CHAIRMAN concluded the meeting.

HORNSEY GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Friday, the 2nd inst., at the Offices, Chancery Lane, W.C.—Mr. JOHN DREW in the chair.

The notice convening the meeting having been read, the report and accounts were presented.

The CHAIRMAN, in moving their adoption, dealt at some length with the causes which had led to the prevailing high prices of coal, and expressed his belief that, though this commodity would not be so cheap in the near future as it had been, the prices now paid did not represent the true market value. He remarked that the Board were averse to raising the charge for gas, but said this would have to be done if coal became dearer. The standard price the Company were authorized to charge was 3s. 9d. per 1000 cubic feet, which was reduced to 3s. 6d. in 1888, to 3s. 4d. in 1889, to 3s. 2d. in 1895, and to 3s. 1d. and 3s. in 1899; and the consumers, who had in consequence profited to the extent of £42,267 18s. 8d. in eleven years, could hardly object to paying a higher rate if the Company were forced to resort to it. The profits of the Company would be reduced by £2500 by a rise of 2s. 6d. per ton in coal. With regard to oil, the contracts would hold good until October; but the price had risen, and more would therefore have to be paid for it. The manufacture of gas by the carburetted water-gas plant had been a great boon to the Company, and had helped the Directors out of several difficulties. Turning to the subject of capital, he pointed out that the total amount raised on that account was £184,715, but that £194,856 had been spent; leaving a debt of £10,141 to the revenue account. During the past five years, £43,555 13s. 10d. had been laid out in providing new retort-houses, water-gas plant, and purifying machinery; while in the same period only £34,613 had been raised. Quite recently, £11,315 had been obtained by selling £9000 of 5 per cent. preference stock, which would more than cover the debt on capital account. In addition, there was a sum of £5978 of ordinary stock to be called up; and after this had been done, there would still remain £4324 of debenture stock to be borrowed. This year, however, £6000 would be required for new mains, &c., and £2500 for land and houses; consequently, application would have to be made in the next or following session of Parliament for power to raise additional capital. He concluded by calling the attention of the shareholders to the very large increase in the quantity of gas sold (15 million cubic feet), which was equal to 11 per cent., and showed clearly the vitality of the Company.

The report and accounts were adopted, and dividends at the rate of 11¾ per cent. on the "A" stock and of 8¾ per cent. on the "B," "C," and "D" stocks, were declared.

On the motion of the CHAIRMAN, seconded by Mr. E. T. E. BESLEY, Q.C., it was resolved that the "B," "C," and "D" stocks should be consolidated and converted into one stock.

The two retiring Directors (Mr. W. P. Bodkin and Mr. John Miles) and the retiring Auditor (Mr. F. E. Bodkin) having been re-elected, it was unanimously resolved that the remuneration of the Directors be increased from £800 to £1000 per annum.

Sir H. B. POLAND, on the part of the Directors, thanked the shareholders for their confidence in the Board; and the proceedings then terminated.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 3, Lothbury, E.C.—Mr. JOHN AIRD, M.P., in the chair.

The SECRETARY (Mr. W. B. Peat) having read the notice convening the meeting,

The CHAIRMAN said the result of the year's working had, the Directors thought, been satisfactory. They had maintained that good feeling with the Authorities which had existed since the concession was first obtained, nearly thirty years ago. The Directors were able again this year to pay the dividend, as well as the bonus; and this result, in the face of some little difficulties which had occurred during the year, was very gratifying. They had had to incur certain expenditure in connection with a fault in one of the walls of their large reservoir—not in any way associated with the main wall, but the wall which protected one of the tributaries to the reservoir. This had entailed an additional outlay of some £200 or £300. But the difficulty was not a serious one; and it was being grappled with. They had also had to pay, like most other gas companies, more for coal. However, this had not been a serious item, because the money which they had obtained for coke had been much more, and in a great measure equalized the increase on the coal. In addition, more had had to be paid on account of exchange, in consequence of the increased rate. This had been somewhat exceptional in the past year; and they would probably have to pay an additional £200. Turning to more pleasing matters, there had, he said, been an increase in both the water and gas receipts, and the electric lighting also showed a larger profit. The rainfall, too, had been perfectly satisfactory, and had enabled the Company to keep their reservoirs sufficiently filled to ensure throughout a complete supply, not only to Cagliari, but also to the adjoining villages. Arrangements had been made to dispose of certain property which was bought some year or two since around the main reservoir; the Company retaining the land immediately adjacent to the water. The price received for the property in the re-sale had left them sufficient land to protect their works without any charge. Another very gratifying point was that during July last, a Government Commission inspected the works. It consisted of the Prefect, the Chief Government Engineer, the head of the Sanitary Department, and two medical men. They visited the reservoirs, found everything in perfect order, and expressed their complete satisfaction. The Company had benefited in the past year, and hoped to benefit still more, from an arrangement lately made, under the advice of Mr. Simmelkjör, their co-Director, to let out on hire the different gas fittings and services. It might interest many connected with similar companies to know that 1265 customers paid for their fittings, and 577 had them on hire, paying 10,598 frs. during the year. The capital employed in constructing these fittings and services was represented by 114,000 frs. It would be seen that not only did this increase the supply and the number of consumers, but it gave them a return on the capital employed of 9·28 per cent. per annum. It might also be of interest to know that out of 1842 consumers which they had in addition to the public supplies, 385 were served by meter, and 1457 by contract. The illuminating power of the gas had been kept up to the standard during the year; and consequently no fines had been levied. The unaccounted-for gas showed a slight increase; but the Directors were quite prepared to accept the explanation given by their representatives in Cagliari that this was, in great measure, due to the visit of the King of Sardinia. No doubt the great festivities entailed a larger consumption of gas; and the Company were desirous of assisting the inhabitants as much as possible in rendering the visit a happy occasion, and one worthy of Cagliari. The increase in the private lighting was very satisfactory. It was 14 per cent. over 1898, and was to a large extent due to the use of heating and cooking stoves. With regard to the management of the Company, after the death of Mr. Craig, the Directors appointed Mr. Ernesto Sanna to succeed him. The Directors desired to express their satisfaction of the earnest care and great interest Mr. Sanna took in the concern; and they wished also to place on record their appreciation of the efforts of Mr. Anderson and Mr. Webster. The Board felt sure that in the coming year these gentlemen would fulfil in an equally attentive manner the duties appertaining to their offices. A very able report had been prepared by Mr. Simmelkjör as to the future prospects of the Company. In the course of it, he said: "It is a matter of congratulation that the receipts of the Company continued to increase so fast, that we have already arrived at the same figure of total receipts as we had before the subvention was reduced." In formally moving that the report and accounts be adopted, he (the Chairman) might say how pleased the Directors were to be able to place before the shareholders a report which was encouraging both as regards the present position and future success of the Company.

Sir FREDERICK WIGAN, Bart., seconded the motion.

Mr. R. PAYNE called attention to an item on the debit side of the balance-sheet, "Mains, &c., at the village of Pirri, £1666 17s. 5d.," and said, on the other side, there was a credit of a similar amount. He should like to know whether this was an available asset.

The CHAIRMAN replied that the Directors had always been anxious not to increase the capital account; and certain expenditure had been incurred which was properly capital, but which had not been so charged. This outlay at Pirri (which was an important village) would be repaid; and meanwhile interest was being paid on the money. The Board regarded it as a good asset; and this was why it had been dealt with in this way.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. C. A. SWINBURNE, the interim dividend at the rate of 6 per cent. per annum was confirmed, and one at the rate of 8 per cent. for the past half year was declared, together with a bonus of 2s. 6d. per share.

Resolutions were also passed, re-electing the retiring Directors (Messrs. Blunt and Swinburne), and the Auditors (Messrs. Bishop and Robb).

The usual complimentary vote to the Chairman and Directors and officials concluded the proceedings.

ELECTRIC LIGHTING NOTES.

The application of the Salford Town Council for power to borrow £398,683 for purposes of electricity supply has resulted in the Board sanctioning £397,408. The sums excluded for the present are connected with drainage and retaining-wall work.

The Sutton Coldfield Town Council on Wednesday resolved to make application to the Local Government Board for sanction to borrow £26,000 for electric lighting works, and an additional £10,000 for future extensions to Four Oaks and other parts of the borough.

The Lincoln City Council have decided to apply to the Local Government Board for power to borrow £6000 to provide for the extension of the electric lighting plant. It is estimated that the additions will raise the number of lamps capable of being supplied from 18,000 to 25,000. The Committee are hopeful that in the coming year they will be able to pay their way, and have something to hand over to the rates.

The tradesmen of Wakefield have been discussing, at a meeting of their Association, the question of the charge for electricity; and it resulted in the passing of a resolution to apply to the Corporation for a reduction of the price for lighting purposes, the abolition of the rebate system, and a

reduction of meter-rents. The general opinion of the members was that the working of the rebate system had proved unsatisfactory, and that a lower charge per unit would lead to an increased consumption.

It was reported at the meeting of the Liverpool Corporation last Wednesday, that the accounts of the Electric Lighting Department for 1899 showed a net balance of £11,206. The Committee proposed to put £6000 of this to the credit of the renewal account, and the balance to the reserve account. Exception was taken to the passing of the recommendation, without a proper statement of accounts being submitted; and consequently its consideration was deferred until the accounts had been printed and circulated.

The West Hartlepool electric lighting project (says a northern contemporary) continues to make slow progress towards realization; and the patience of the city fathers thereat appears to be almost exhausted. The plant has been in readiness and the cables laid months ago; but the generating station is still far from completion, though the contractor responsible for that important adjunct of the scheme is understood to have been repeatedly "hurried up" in no gentle fashion. The public were promised the light more than a year ago; and last Tuesday, the Corporation came to a decision which makes it clear that they do not intend to brook further unreasonable delay.

It is estimated that £74,536 will be required for the erection and equipment of the power-house of the Devonport municipal electricity station; and the Town Council last Thursday sanctioned an application to the Local Government Board for permission to borrow the money. Electricity is to be generated not only for lighting purposes, but as motive power for various tramway schemes which are being carried out. In order to keep faith with one of the tramway companies, plant for traction purposes is to be forthwith provided. Alderman J. B. James, Chairman of the Electric Lighting Committee, said that some might consider the estimated cost of the works heavy; but it compared favourably with other towns. They were in an unfortunate situation with regard to the supply of motive power, because there was an enormous demand for engines and plant, and they were not equal to meeting it.

The tone of some remarks made at the meeting of the Sudbury (Suffolk) Town Council last Wednesday gives hope that the members are becoming a little more reasonable, and will consult the ratepayers in a proper manner before they venture into the electric lighting business, which, from the showing of their own electrical expert, is not likely to prove a very lucrative one for the town. As stated on a previous occasion in these "Notes," a circular has been sent round to a number of householders and tradesmen in the thoroughfares in which it is proposed to lay the cables; and, according to the Mayor, a good many of the replies which have been received are satisfactory. That may be; but it will require a considerable number of these satisfactory replies in Sudbury to make the suggested undertaking reach a paying level. Alderman Bell and Mr. Constable strongly urged the Council to fairly face the ratepayers on the question before committing themselves; and it is to be hoped that the sound arguments they advanced will have due weight.

At the meeting of the Exeter City Council last Wednesday, some particulars were given of the costs which have been incurred in contesting the claim of Mr. Rucker to a patent which it was alleged controlled the whole manufacture and use of transformers. The action was brought against the London Electric Supply Corporation; but a Defence Committee was formed, and the Exeter Corporation, among others, were subscribers to the fund. The Town Clerk stated that the action had been dismissed with costs, but that until the amount could be recovered from the plaintiff the defendants had to pay the costs. Another call had, therefore, to be made on the subscribers. The costs of Counsel, documents, &c., amounted to £4548, and the solicitors' costs to about £1000. Calls had been made to the extent of £2533; so that £3015 had to be raised. Exeter had already paid £5 8s., and was now asked to pay £19 9s. 5d. A cheque was drawn for the amount; the Town Clerk adding that this was cheaper than either defending the action or settling with the plaintiff for the use of the transformers.

After considerable delay, the Local Government Board have given their sanction to the raising of a further portion of the loan of £10,000 asked for by the Torquay Corporation for the extension of the electric lighting works. They, however, decline to permit the borrowing of £164 spent on works which were rendered useless by the change of the site of the generating station, and £200 excess of expenditure over the estimate in the case of the rectifiers. Yesterday week, the Town Council decided to apply for a further loan of £10,000 for additional generating and other plant, and £5000 for the extension of mains. In order to save time, the Electric Lighting Committee recommended that tenders for the work contemplated should be accepted conditionally upon the loan being sanctioned; also that the work be carried out under the superintendence of Mr. Storey, the Borough Electrical Engineer. Alderman Kerswill, Chairman of the Committee, stated that when the supply of electricity was commenced two years ago there were 55 private consumers and 3200 8-candle power lamps connected; whereas now there were 214 consumers, with 11,326 lamp connections. The total capacity of the plant was 11,500 lamps; so that it was loaded to a dangerous extent.

On the recommendation of the Electric Lighting Committee, the King's Lynn Corporation have decided to apply to the Local Government Board for power to borrow £10,000 in order to extend their works. Before the application is granted, however, there will be a tussle with some of the ratepayers. One of these—Mr. Thomas Brown, a shareholder in the Gas Company—considers it to be his duty to oppose; and at a meeting of the Company a few days ago, he stated that he had asked several of his friends, who were also large ratepayers, to join him in that opposition when the Inspector came down. Before the Local Government Board would sanction the spending of this further £10,000, the Corporation had to prove that it was reasonable and right that it should be spent; and he believed that he could show, on the contrary, that it would be a very unwise expenditure. The Corporation had already laid out £30,000 or £32,000 in an experiment with electric lighting; and he thought this was quite sufficient for a small borough like King's Lynn to spend. If in the course of another twelve months the Corporation could prove that the present expenditure had been wise and businesslike, and that the results were such as would satisfy any investor of a similar sum, his objection would fail. He had promises of support amounting to about £20,000—one-fourth of the rateable value; and the cost would only be about £20 altogether. It was argued that the Corporation must go on spending, because they were compelled to supply electric current to any ratepayer who desired to have it. But they were not obliged to supply the public lamps; and a quarter of the total current was now going to them. Everybody outside the borough who had seen the light given by the beautiful little glow-worms said the public lighting was a miserable failure. He contended that gas with incandescent burners was the illuminant for public thoroughfares; and the Corporation ought to make a bargain with the Gas Company to do the street lighting. He was told there were 990 electric lamps where there used to be about 412 gas-lamps; and the cost would be enormous. He was sure he was right in saying that with incandescent gas-burners the Gas Company could give four times the present light at about half the cost. The Company decided to contribute a sum not exceeding £5 in joining with other ratepayers in protesting against any further capital expenditure.

A striking example of how an electric lighting account can be "adjusted" was afforded at a recent meeting of the Southampton Town Council. A statement of income and expenditure for the nine months ending Dec. 31 last, prepared by the Borough Accountant (Mr. A. Ramshaw) in accordance with the resolution of the Council of June 28, 1899, had been submitted to the Electric Lighting Committee. It was resolved that they failed to see the value of the return, in which the income received and the liabilities incurred were set forth as identical with the amounts estimated in the previous year, and that Mr. Ramshaw be requested to prepare a return of the actual income, including assets, and the actual expenditure, including liabilities, for the nine months ending the 31st of December. One of the members of the Council (Alderman Le Feuvre), referring to this matter, said the financial estimate presented to the Council with reference to the Electricity Department set forth that they expected to receive £10,152 10s., and to spend £9969; and in the statement submitted to the Committee it was shown that £7614 7s. 6d. was the actual income. It turned out, on close examination of these figures, that £7614 and three half-crowns was exactly three-fourths of the estimated income for the whole twelve months. It was an extraordinary fact that the Electricity Committee had received three-fourths, as was said in Committee, to a postage stamp. When they came to the expenditure, they saw it was estimated at £9969 13s. 7d. If they took three-fourths of this they would arrive at £7477 5s. 2d.; and, by a most extraordinary coincidence, this was actually the expenditure for the nine months. (A Voice: Marvellous.) His friend said "Marvellous;" but he was going to use another word. He said it was not marvellous, but a frightful exhibition of the way an account could be cooked; and he was sorry to say there must have been two departments engaged in preparing this account. If it was got up in that way, how could they be sure that they had correct figures with regard to other departments? He would say it was a melancholy exhibition to save the trouble of going into the actual income for the nine months, that the estimated income and expenditure should have been divided by three-quarters, and some gentleman should have thought that many of the 52 members of the Council would not take the trouble to examine into them. He endorsed the resolution the Committee came to. Alderman Bance remarked that it seemed to him to be a very natural complaint on the part of Alderman Le Feuvre; but he was a member of the Committee, and had the privilege of seeing these accounts, which were not printed, and it could scarcely be said that the whole of the 52 members could have seen them. Alderman Le Feuvre acknowledged that he was wrong in saying the whole of the 52. Alderman Bance went on to say it seemed to him that the return was a bogus one, and therefore it made one suspicious as to what state the department could be in to submit such a thing; and how the head of the department could be so lax as to bring up the statement, he could not understand. The Finance Committee would do well to look into the department, and see how it was that they could get a return of such a character. Mr. Blakeway stated, as a member of the Committee, that he was in sympathy with their resolution. They felt disgusted, as a trading Committee, that they were denied the privilege of knowing the position in which they stood at the end of a certain period. It was one of the most important Committees, and they intended to have a proper account kept of the liabilities and assets. The Committee were not going to lose sight of the resolution; and it gave him pleasure to support everything Alderman Le Feuvre had said with reference to the matter. Alderman Bone said the Electricity Committee had nothing to do with the preparation of the return. It was the Borough Accountant; and if he could not get it, he should have called the Electricity Committee, who would have used their authority. The further particulars would be prepared and presented; but as far as the Electricity Committee were concerned, there was no responsibility for the return. It was the Borough Accountant's department; and therefore the Electricity Committee should not be blamed. Alderman Le Feuvre said that when he spoke previously on the subject of the resolution of the Electricity Committee he did so not only as a member of that Committee, but also as a member of the Finance Committee. He said he cordially endorsed every word of the resolution which was unanimously passed by the former Committee. That Committee had no knowledge of the return. It was placed on the table; and he supposed he was the only member who saw it before it was put there. What they complained of was that they had not an opportunity of seeing what the return was.

West Bromwich Gas Supply.—In moving, at the meeting of the West Bromwich Town Council last Wednesday, that £2000 out of the gas profits of the year be allocated in relief of the general district rate, Mr. Bushell said the cost of material had so increased that the Committee could hold out no hope of any profit next year; and it might be necessary to increase the price of gas. Alderman Blades thought the price should be kept down, so that consumers should have the benefit.

The Morley Corporation and their Gas Workers.—At the meeting of the Morley Town Council on Monday last week, the Gas Committee reported that they had had an interview with the stokers employed at the gas-works with regard to their demand for the following concessions: Eight hours a day, extra men to work low fires, 5s. 3d. per shift, and double time for Christmas Day and Good Friday; and that the question had been settled by re-arranging the hours of employment, and offering the men 5s. 3d. per shift of eight hours, and double time for Christmas Day and Good Friday. The men have accepted the offer.

LONDON COUNTY COUNCIL AND THE WATER QUESTION.

Reply to the Report of the Royal Commission—The Government to be Approached.

At the Meeting of the London County Council last Tuesday—Lord Welby in the chair—the Water Committee presented a long report on the subject of the report of the Royal Commission on the Metropolitan Water Supply, a full abstract of which has already been given in the "Journal." In their introductory remarks, the Committee say that seeing that the long investigation by the Commission closed on the 23rd of March last year, they hoped to have been in possession of the report in time to allow the Council to give the whole subject mature consideration before being obliged to decide upon their policy in regard to proceeding with the Bills already deposited in Parliament. The period, however, within which a decision must be come to on this question was so short that the Committee thought it well to place the Council at once in possession of their views as to the general effect of the report, though it was impossible to enter upon any detailed criticism of it which they might have desired. They then proceeded to set forth at length the Council's water policy, which has always been "purchase and public ownership of the Metropolitan Water Supply." They went on to say that in 1895 a Parliamentary Committee presided over by Mr. David Plunket practically assented to two propositions—first, that it was expedient that the Council should purchase; and, secondly, that the terms of purchase should not be those usual under the Lands Clauses Acts. The Council's Bills would, it was believed, have probably been passed, had it not been for the sudden dissolution of Parliament. In the following year the Commission was appointed to inquire into the expediency of purchase in the interests of the ratepayers and water consumers. After giving a short account of the proceedings before that body, the Committee dealt with the recommendations. Taking first the question of purchase, the Committee claimed that the report of the Commission "once more affirms the main principles for which the Council have contended, and does so with the very arguments that have been used in support of this policy during the whole course of the controversy." As to the terms of purchase, the Committee considered that if the recommendations of the Commission were properly carried into effect, it would be desirable to have some special form of arbitration clause, such as the one their Counsel submitted to the Commission, in which they put forward the view that "the fair value of the Companies' undertakings should be ascertained by a court of arbitration of the highest standing, with the fullest powers to inquire into all the circumstances of each individual case." The Committee expressed the belief that the views to which they gave expression were in accordance with those held by the Council; but if the present form of clause appeared to be unsuitable, they had no doubt the Council would not refuse to accept some reasonable modification of it. They thought some arrangement might be arrived at with Her Majesty's Government; and they suggested that negotiations should be at once set on foot with this object. The Committee next dealt with the question of the future Water Authority suggested by the Commission. As the proposed Water Board would give London only one-third of the total number of members, while on the basis of population or rateable value it would be entitled to at least three-fourths, the Committee considered that the proposal was one which could never be fairly imposed. Apart from the objections in principle to the water supply being entrusted to a body that would not directly represent the public, it was not likely that so heterogeneous a Trust as that which was proposed would afford a really satisfactory administrative body. These and other conclusions led the Committee to the conclusion that the Board proposed by the Commission was open to very serious objections; but they thought it was not impossible that some form of joint management between Inner and Outer London might be suggested which London could agree to. In any case, as the expediency of purchase by some authority had been affirmed by the Commission, there could be no reason why Parliament should not in the present session decide upon the method and principle of purchase, apart from the question of ultimate management. The Committee devoted the concluding portion of their report to the consideration of the future supply of water to the Metropolis, and discussed the observations of the Commission on the comparative cost of the Welsh and Thames supplies. In their view, it was not inconceivable that, after a vast system of storage reservoirs had been constructed at Staines, circumstances might arise which would render the condition of the river so serious that London would, long before 1941, be forced by pubic opinion to incur an expenditure upon further storage greatly in excess of that indicated by the Commissioners. With regard to the cost of storage as affected by the experience of 1898 and 1899, the Committee said:

As far as can be ascertained from their report, it would seem that, in the opinion of the Commission, the gross storage required to satisfy the conditions of a year like 1893, and to supply 300 million gallons a day, is 23,677 million gallons, and the cost of this will be £14,800,000. We are, however, advised that if the storage is to meet the needs of a year similar to 1898, the gross amount would have to be increased by about 12,700 million gallons, and would cost about £17,500,000. Further, if the works are to be capable of complying with the conditions of two consecutive dry years, such as were the years 1898 and 1899, then the gross storage would have to be 49,800 million gallons, and would cost about £21,800,000. If our view of the case is correct—viz, that in constructing works for the future the needs of the most unfavourable year must be provided for—the cost of a Staines scheme will exceed that of a Welsh scheme. But even if we accept the estimates of cost arrived at by the Commissioners, there still remain weighty objections to the construction of storage reservoirs standing, as those in course of erection do, high above the level of the land, and covering, as the Commission state, no less than 10 square miles of country; and when all things are considered, it may be more to the interests of London to incur the necessary expenditure, and obtain thereby a supply of unpolluted and soft water stored in the hills of Wales and delivered to London by gravitation, than to draw from more or less polluted rivers large additional quantities of hard water, and store it in vast and dangerous reservoirs in the midst of what will soon be populous suburbs.

As to the necessity of securing a water-bearing area, the Committee pointed out that opportunities for obtaining any such supply as that contemplated in Wales are every year becoming fewer, and it was highly probable, if London took no action at the present time, that within the next few years every water-bearing area of sufficient size, within a reasonable distance of the Metropolis, would be appropriated by other cities. They thought, therefore, it was incumbent upon the Council to make some attempt to safeguard London in the future. They quoted the paragraph of the report in which the Commissioners said: "There is no doubt something attractive in the scheme of bringing water from the Welsh mountains for the supply of London; and one would be glad if it were possible now to secure a watershed to be used hereafter, if London should require it." The Committee remark that the opportunity of obtaining this was provided by the Council's Welsh Supply Bill; and they trust Parliament would not refuse to allow that Bill to go forward, for the purpose, at any rate, of authorizing the acquisition, on behalf of the public, of the rights of purchasing the lands in Wales, as to which notices had been given. The powers so obtained might, they said, be held in abeyance, or be directed to be transferred to a future authority if it should require them, and if, after further investigation into this difficult problem, Parliament should deem it advisable that the future supply of the Metropolis should be drawn from Wales rather than from the Thames. In this respect, therefore, they came to the conclusion that Her Majesty's Government should at once be approached, with the view to ascertain whether there might not be some means whereby the Welsh Supply Bill could be allowed to proceed; and they recommended—"(1) That, in view of the urgent reasons which exist against further delay in dealing with the question of London Water Supply, the First Lord of the Treasury be requested to receive a deputation with reference to the London Water (Purchase) Bill and the London Water (Welsh Supply) Bill; and (2) that it be referred to the Parliamentary and Water Committees to make the necessary arrangements for the deputation."

Mr. Dickinson (Chairman of the Water Committee), in moving the adoption of the first recommendation, said the Council would all agree that the London Water Question was one of great complexity, and that it was impossible to deal with it upon any narrow or preconceived notions. The London Conservative members had decided to ask for the rejection of the Council's Bills. In doing this, they had taken upon themselves a very grave responsibility. A turning-point had now been reached in the matter. The Council must either go forward with the policy of purchase, or they must drop it. The report of the Royal Commission, in so far as that policy was concerned, was in absolute agreement with all the Council had been pressing for during the last ten years. With regard to the terms, they were not quite in such absolute agreement. The Council had always contended that the Companies should be bought out upon the basis of competing concerns, and not as monopolies, since they had only acquired the monopoly by agreement between themselves. In this the Commission did not entirely concur; but he did not say the Council would not be justified in accepting something less than they had asked for. The Commission had looked upon the matter of price from the worst point of view for the public; and he was sanguine that, when this question came to be settled, the public would find that they had a better bargain than was forecast by the Commission. In regard to the sinking-fund clauses suggested by the Commissioners, the Council should be congratulated, for it was what they had always contended for. With regard to the matter of the future supply, he did not think they would ever have the question of Thames storage against Welsh supply settled until they got rid of private interests. The Commission had apparently reported in favour of storage entirely on the question of cost; but he believed, if the matter were fairly settled, it would be as cheap to get a proper supply from Wales as to build enormous and hideous reservoirs in the Thames Valley. At any rate, they now had the opportunity of obtaining a water-bearing area in Wales; and such areas were very few. The suggested allocation of members on the proposed Water Board would, if carried into effect, result in a gross injustice to London, which was to have 10 members only, while the outside Authorities were to have 12. As London would have by far the heaviest burden to bear in the matter, and would have to find the greatest amount of money, he claimed that it should have a majority on the Board. Any new body to deal with the water supply should owe its origin to municipal life and energy. But the Water Committee were willing, in the interests of London—disagreeing as they did with some of the suggestions of the Commission—to effect a compromise; and, as the first step, they considered it advisable to approach the Government on the matter.

Mr. Harris said he could not understand on what particular lines it was suggested that they should approach the Government. Briefly stated, the Commission had reported in favour of the policy of the minority of the Council, and adversely to that of the majority. It would not be reasonable to expect those whose policy had been upheld by the Commission to ask the Government to carry out the policy which had been condemned; and it would not be reasonable or fruitful of good results to go to the Government who had appointed the Commission and ask them to carry out any condemned policy. The Water Committee were practically asking the Council to go forward with the old policy of the majority, which was known as that of severance, without any assurance as to modification. He moved, as an amendment, to leave out of the resolution all words after "with reference to," and substitute the words "the report of the Royal Commission, and action on the broad lines laid down in that report." He believed this to be a more promising basis of negotiation than that proposed by the Committee. At any rate, in assenting to the deputation, the minority on the Council would safeguard their own opinions, which, in the result, had received the support of the Commission.

Mr. Beachcroft, in seconding the amendment, said the main endeavour of the Council at the present time should be to induce the Government to carry out the recommendations of the Commission. He did not think it was possible for a compromise to be arrived at before the second reading of the Council's Bills. It was hopeless to think that the Welsh Bill could be sent to a Committee this session, in face of the report of the Commission. Before that could be settled, they must deal with the question of purchase and authority. The Council had obtained nearly all they wanted in the findings of the Commission; and they should now go to the Government and offer their help in giving effect to those findings, and attempting to discover the cost, and seeing whether they could not settle an authority satisfactory to all parties.

Mr. Cornwall remarked that, looking to the urgency of the matter, he could see no reason why the Government should not take the Council's Bills as a basis of settlement.

Mr. WHITMORE, M.P., welcomed Mr. Dickinson's speech as being couched in conciliatory terms. He denied that the contemplated action of the London Unionist members in this matter was either obstructive or destructive. Speaking for himself, he wished to see the water question settled both satisfactorily and quickly; and he thought it could be settled on the lines of the Royal Commission report. Undoubtedly, a second reading would be refused to the Council's Bills, and rightly so, because, on the whole, they were in direct conflict with the report of the Commission. If the Progressives would now only join hands with the Moderates in trying to get the Government to take up the matter on the lines of the report, the present might be the opportunity for sinking all their differences on a subject which ought never to have been allowed to enter the arid arena of party politics, and for bringing the whole matter to a satisfactory settlement.

Mr. M'KINNON WOOD supported the recommendation, and denied that the Council were pledged to a policy of severance. They were quite prepared, if it was practicable, to meet the views of the other side and those expressed by the Commission. But to go to the Government and back up a proposal for a Water Trust such as that suggested by the Commission, was a course to which he believed the members of his party would never consent.

Sir A. ARNOLD congratulated the Council on the remarkable unanimity shown in the matter of approaching the Government on the water question. It was the duty of the Council to go to them and say: "Here are our Bills; is it possible to make any use of these proposals?" He would never be a party to the constitution of such an authority as that which was set forth by the Commission, because they could not give up the reasonable claim of the people of London to a due proportion of representation. Further, he objected to the establishment in London of another non-representative body.

Mr. COHEN, M.P., pointed out that the London Unionist members had not pledged themselves to support all the details of the proposals of the Commission. They only said that they formed the lines on which it was possible that the matter could be fairly settled.

Dr. WHITE thought they were likely to do little unless they were prepared to accept, not in word, but in substance, the recommendations of the Commission.

Mr. STUART, M.P., said it would facilitate the whole position if they knew what the Government intended to do with the Council's Bills, which were to come up on the following Tuesday. This should be seen to at once; but the matter of the report of the Commission might be left over for the present. He was glad to recognize the conciliatory spirit in the Council; and, in order to avoid a division, he would suggest that the amendment should be withdrawn, and the words "having regard to the report of the recent Royal Commission" added to the recommendation.

Mr. LAWSON pointed out that delay was fatal, for it would render the cost of purchase infinitely greater. As there were so many points of agreement, and as legislation could only come this session through the Council's Bills, he hoped the Council would accept the recommendation with the addition suggested by Mr. Stuart.

Mr. COUSINS condemned the expenditure entailed by the Council in promoting Bills which they knew would not be accepted.

Mr. DICKINSON, in closing the debate, expressed regret that his Committee had not been met in any way by the Moderates. The amendment would certainly tie their hands, and make it impossible that there should be any legislation this year. He could not accept the amendment, but would be willing to place at the end of the recommendation the words suggested by Mr. Stuart. He appealed to Mr. Harris to withdraw his amendment, and allow the matter to go forward on the broad lines suggested by the Committee.

No reply being made by Mr. Harris, the Council divided, with this result: For the amendment, 30; against it, 70—majority, 40.

Sir J. HUTTON then moved to add to the recommendation the words "having regard to the report of the recent Royal Commission."

Colonel FORD seconded the amendment; and it was agreed to.

The recommendation, as amended, was then carried, on a division, by 72 votes to 29. The matter was referred to the Parliamentary and Water Committees.

Heswall and Acetylene Gas.—A Gas and Lighting Company was recently formed for the purpose of supplying acetylene gas in the parish of Heswall; but the promoters have been speedily disappointed. A request for the consent of the Parish Council to an application to the Board of Trade for a Provisional Order led to the matter being considered by a Committee; and, presumably on their advice, the Council decided to refuse the application. However, in order to give the ratepayers a voice in the matter, a public meeting was held, at which the Council laid the whole question before them. The place of meeting, it is stated, was beautifully illuminated by Husson's "Safety" acetylene gas. The matter seems to have been fairly discussed; and, in the result, the ratepayers confirmed the decision of the Council—it being considered preferable that the Council should adopt the Lighting Act on their own account.

The Management and Development of the Birkenhead Gas and Water Undertakings.—At the meeting of the Birkenhead Town Council last Wednesday, Alderman Bloor, on the presentation of the minutes of the Gas, Water, &c., Committee, referred to a recommendation to increase the salary of Mr. T. O. Paterson, the Gas Engineer, by £100 a year. He said Mr. Paterson was appointed in 1880, and had had only one rise of £50 ten years ago. He did not ask for an increase then, nor had he done so now. The Committee recommended the increase with every confidence, as their Engineer was a most valuable servant, and the work had enormously increased. In 1880, there were 6025 consumers, now there were 13,000; and during the twenty years the Gas Committee had handed over £98,200 in relief of the rates. All the numerous new works had been carried out from the Engineer's own plans. The resolution was unanimously adopted. Alderman Bloor then moved that the salary of Mr. W. A. Richardson, the Water Engineer, should be increased by £50. He also had been in their service twenty years, and had only had one increase of £50 in ten years. He had done valuable work, and was thoroughly worth the increased salary, having saved the town large sums of money by his skilful work. The water estate in twenty years had contributed £35,000 to the borough funds. The resolution was carried unanimously.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 667.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	14—15	..	5 0 0
800,000	100	Jan. 2	5	Australian 5 p. c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd. . . .	6¼—6¾	+¼	4 8 11
40,000	5	,,	6	Do. New, £4 paid .	4¼—4¾	+¼	5 1 1
880,000	Stk.	Feb. 23	12	Brentford Consolidated	267—272*	..	4 8 3
270,000	,,	,,	9	Do. New . . .	203—208*	..	4 6 7
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145*	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb. .	118—123	..	3 5 1
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig. .	255—260	..	4 8 6
226,320	,,	,,	8½	Do. A. Ord. Stk. .	185—190	..	4 9 6
999,500	Stk.	Feb. 23	5	Bristol, 5 p. c. max. .	125—130*	..	3 16 11
420,000	20	Sept. 29	10	British	43—44	..	4 10 11
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c. .	24—26*	..	4 12 4
79,000	10	,,	9	Do. 7 p. c. . . .	19—21*	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¾—10¼	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .	98—100	..	4 0 0
150,000	20	July 13	8½	Cagliari, Ltd. . . .	26—28	..	5 17 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13¾—14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Oct 13	13½	Commercial Old Stock .	305—310	..	4 7 1
200,750	,,	,,	10½	Do. New do. .	240—245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb. .	142—145	+1	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	170—180	−4	5 0 0
200,000	,,	,,	7	Do. 7 p. c. Pref. .	178—183	..	3 16 6
51,600	Stk	Feb. 23	14	Croydon A 10 p. c. . .	335—340*	..	4 2 4
173,400	,,	,,	11	Do. B 7 p. c. . .	265—270*	..	4 1 5
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p.c.	122—127*	..	4 2 8
60,000	,,	,,	5	Do. 5 p. c. Pref. .	132—137*	..	3 13 0
486,090	10	Jan. 26	11	European, Ltd. . . .	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid .	15—16	..	5 3 2
14,993,075	Stk.	Feb. 9	4⅗	Gas-light and Coke	4 p. c. Ord. . .	103—105	−2	4 13 4
2,600,000	,,	,,	3½		3½ p. c. max. .	97—99	+1	3 10 8
3,799,735	,,	,,	4		4 p. c. Con. Pref.	119—122	..	3 5 7
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	99—101	..	2 19 5
70,000	10	Nov. 15	8	Hongkong & China, Ltd.		13¼—14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental .		215—218	−2	4 11 9
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red,		100—103	..	3 8 0
75,000	5	Dec. 14	6	Malta & Medn., Ltd. .		4½—5½	..	5 9 1
560,000	100	Oct. 2	5	Met. of Melbourne	5 p. c. Deb.	110—114	..	4 7 9
250,000	100	,,	4½		4½ p. c. Deb.	107—109	..	4 2 7
541,920	20	Nov. 15	3	Monte Video, Ltd. . .		11—12	..	5 0 0
666,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.		215—220*	..	4 4 1
299,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb. .		104—107	..	3 5 5
60,000	5	Feb. 23	7	Ottoman, Ltd. . . .		4¾—5¼*	..	6 13 4

* Ex div.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd. . . .	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼—6¾	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½	..	4 11 5
500,000	100	Dec. 1	6	People's Gas of Chicago	2nd Mtg. Bonds .	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord. . . .		11¼—11¾	+¼	5 19 2
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .		100—102	..	3 18 5
250,000	10	Sept. 15	10	San Paulo, Ltd. . . .		12—13	..	7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.		249—251	..	3 19 8
209,053	,,	,,	10	Do. B.		249—251	..	3 19 8
447,427	,,	,,	10	Do. C.		249—251	..	3 19 8
5,600,000	Stk.	Feb. 23	5½	South Metrop., 4 p.c. Cri.		135—138*	+2	3 17 3
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb. . .		100—102	..	2 18 10
120,000	Stk.	Aug. 31	6	Tottenham and Edmonton	A. 5 p.c. B. 3½ p.c. 4 p. c. Deb.	141—143	..	4 3 11
250,520	,,	,,	4½			102—104	..	4 6 6
55,100	,,	Dec. 14	4			113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.		8¼—9½	..	5 5 3
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.		101—104	..	4 16 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.		307—312	..	3 10 6
150,000	,,	,,	5	Do. 5 p. c. Pref. .		157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		145—150	..	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb. .		148—153	..	2 18 10
1,720,560	Stk.	Oct. 18	7	East London, Ord. . .		205—210	..	3 6 8
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb. .		145—150	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb. .		99—101	..	2 19 5
700,000	50	Dec. 14	7½	Grand Junction	10 p. c. max. .	108—110	..	3 8 2
310,000	Stk.	Sept. 29	4		4 p. c. Deb. .	131—136	..	2 18 10
708,000	Stk.	Feb. 23	14	Kent		310—320*	−20	4 7 6
160,000	,,	,,	7	Do. New, 7 p. c. max. .		200—210*	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max. .		295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p. c. max. .		215—220	..	3 12 9
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb. .		135—138	..	2 18 0
500,000	100	Feb. 23	13½	New River, New Shares		420—425*	..	3 3 6
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb. .		132—137	..	2 18 5
902,300	Stk.	Dec. 14	7½	South-wark and Vauxhall	Ord. . . .	200—205	..	3 13 2
126,500	100	,,	7½		7½ p. c. max. .	190—195	..	3 16 11
489,200	Stk.	,,	5		5 p. c. Pref.	160—165	..	3 0 7
1,019,585	,,	Oct. 13	4		4 p. c. A Deb.	131—136	..	2 18 10
1,155,066	Stk.	Dec. 14	10	West Middlesex . . .		290—295	..	3 7 9
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .		147—152	..	2 19 3
200,000	,,	Sept. 15	8	Do. 8 p. c. Deb. .		100—102	..	2 18 10

* Ex div.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Town Council of Aberdeen, on Monday, considered a report by the Gas and Electric Lighting Committee recommending, for the second time, that no action should be taken with reference to the complaint by the Plumbers' Association regarding the fitting up of gas-stoves and the like by servants of the Corporation who are not plumbers. The adoption of the recommendation having been proposed, it was moved that either plumbers should be employed to do the work, or that the men who were employed should be paid the plumbers' standard rate of wages. The Council adopted the recommendation of the Committee by 28 votes to 5. It is difficult to see how they could have done otherwise. The counter-motion was certainly not one which Trade Unionists would have accepted; and had it become the finding of the Council, it would most assuredly have led to further complaints.

The Corporation of Dundee are endeavouring at present to formulate a scheme of holidays for the workmen in their employment. The Conveners of Committees on Monday, after conference, agreed to recommend that the workmen in the Gas Department should receive, with pay for those employed from year to year, four days' holidays, that those in the Water Department should receive five days, and so on. It puzzles me to understand on what principle a gas worker should get a day less than a water-works employee. Possibly the Conveners have a good reason; but whether they have or not, it certainly strikes me that four or five days a year is not very much rest—especially for men who work on Sundays. Hitherto the Corporation have been in the habit of giving their employees a picnic annually; but this is to be discontinued.

The Dumfries Gas Commissioners are advertising that gas consumers may have burners free of cost on applying at the gas office. At the last meeting of the Commission, it was stated that during the past month 25 complaints of want of gas were received from consumers. Some of these were owing to frost, which they could not prevent; but many of the complaints they received were due to old burners. It was stated that in some instances burners had been in use for ten or twelve years. This supplying of gas-burners free is a much disputed question. Those who disapprove of the practice would seem to derive support for their views from the fact that in a town where free burners can be had, people will not apply for them. If free burners are to be given, something more is apparently required than handing them out; a man must be sent to fix them up. The present year at Dumfries, it was reported, showed a large increase in the consumption of gas, and would be the most prosperous year the Commissioners ever had, notwithstanding the disadvantages under which the business has laboured.

In Perth, the gas and electricity undertakings are both in the hands of the Corporation; and they are so much mixed up together that the Secretary for Scotland has found it to be impossible for him to sanction the Commissioners raising money for the electric light undertaking beyond the present borrowing powers of the Gas Commission. He, however, has recommended the Corporation to procure a Provisional Order, under which it would be competent for him to authorize the raising of money for public purposes in the city. The Police Commissioners of the city met on Thursday night, and resolved to proceed with an application for a Provisional Order, in which it is proposed to take powers to borrow £100,000. One-half of this sum is to be for gas, and the other half for electricity purposes. It is not expected that the whole will be required; but it is recognized to be good financial policy to have always something in hand.

Mr. W. Doig, who was for a long time Provost of Forfar, died there on Thursday last. Mr. Doig was a self-educated man. He began life as a hand-loom weaver; but gave up manual labour at an early age, and became a dealer in cattle and game. In this pursuit, he was very successful. But the conditions of his early life imposed many limitations upon him; and while he did much work for his native town, a great deal of which was highly commendable, he had a habit of getting into a minority which frequently led to hard things being said, and to his getting less credit than, perhaps, he deserved for what he did. In the later years of his life, he inclined to the party who affect to look with hostile eyes upon the management of the gas-works, which was certainly much to be regretted, because his influence upon the side of the administering body would have been valuable. While Mr. Doig was Provost of the burgh, gravitation water supply works were constructed, at a cost of £50,000. The Corporation were not satisfied with the quality of a portion of the work, and required it to be reconstructed, at a cost of over £5000. The Contractors declined to do the work; but Provost Doig tenaciously stuck to the position which the Corporation had taken up, and, after an arbitration which lasted for three weeks, he had the satisfaction of receiving an award in favour of the town.

The Falkirk Extension and Water Bills are not, after all, to be contested in Parliament, as it was expected they would be. Yesterday a conference was held between representatives of the burgh of Falkirk and the county of Stirling; and, in the course of a sitting of an hour-and-a-half's duration, terms were come to, by which the Bills promoted by the respective bodies will not be opposed by either. There are other objectors to both measures; but it is expected that their opposition will be trifling. The agreement between the parties is to the effect that the burgh boundaries are to be extended as proposed; the burgh paying compensation to the county for loss of revenue. Then, as to the water supplies, the burgh are to allow the county to retain in their area the district of Laurieston, and are to extend the burgh supply to the portion of the parish of Airth which is not yet supplied by them. The County Council are, in turn, to undertake to supply High Bonnybridge with water—an arrangement which does away with the necessity for the construction, by the Falkirk and Larbert Water Trust, of filters at a high level. The arrangements are mutually advantageous; and the coming to terms before going to London means the saving of more money than will be required to carry the arrangement into execution.

The Edinburgh and District Water Trust are about to appoint a Resident Engineer for their new Talla works. There is some difficulty with the new Contractor (Mr. John Best) as to taking over the work already

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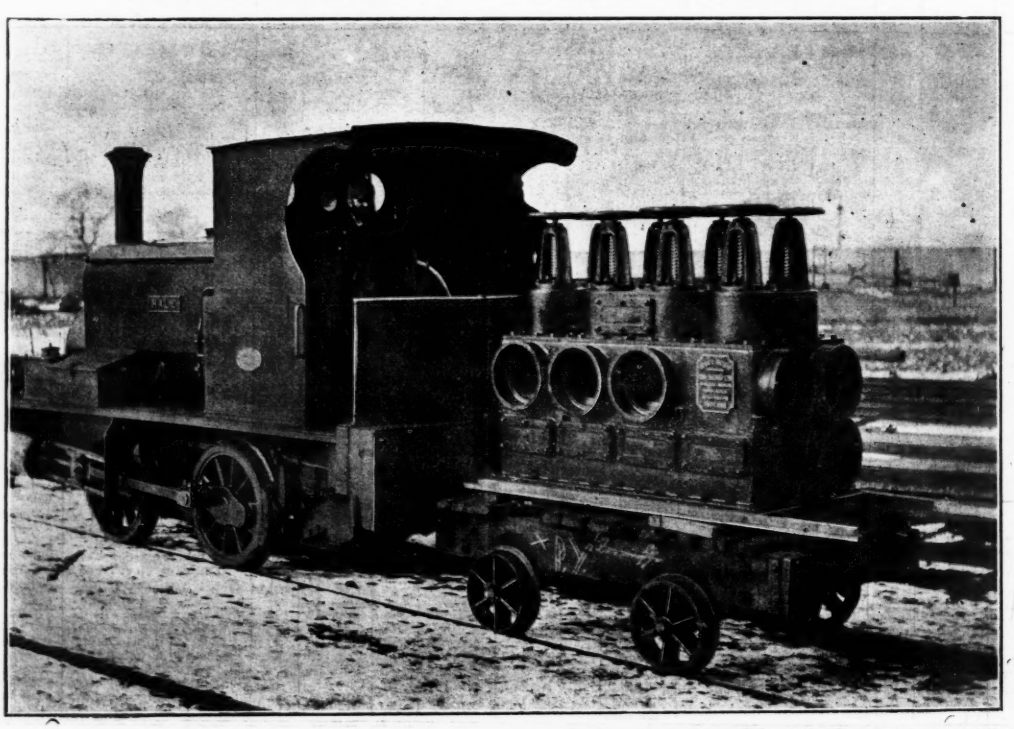

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executed by Messrs. James Young and Sons. Mr. Best will only agree to become responsible for it on condition that it has been executed according to contract. The Water Trust are unwilling to agree to this condition, which, I confess, has a suspicious air about it, because the Trustees can easily satisfy themselves whether the work has or has not been executed according to contract. If it has, such a condition would be useless. The matter is to be referred to the decision of Mr. A. Asher, Q.C. It is, however, wisely considered to be inadvisable to have such an important work as the construction of the puddle trench for the reservoir supervised only by an inspector with a weekly wage of 40s. The Engineer to the Trust (Mr. J. Wilson) is at present enjoying three months' leave of absence, on account of the state of his health. This week the Trust, at his own request, granted him further leave for three months, and appointed Mr. W. A. Tait to be interim Engineer.

The bursting of the embankment of the Loch Glow reservoir last year has entailed an expenditure by the Fife County Council of £4081, of which £1466 has been spent upon the strengthening of the embankment. There is likely to be difficulty over the raising of the money; there being a conflict of opinion as to whether the whole county or the district served by the reservoir should bear the cost of repairing and improving the embankment. A third proposal is to endeavour to fix liability upon the engineers who constructed the reservoir, on the ground that they did not make it sufficiently strong. This latter course is recommended on the strength of a report by an independent engineer; but this gentleman was not called in till after the embankment had given way, and it was by that time patent to everyone that the embankment had not been made sufficiently strong. So that not much encouragement to litigate is obtained from the opinion of the independent engineer. Nothing has as yet been decided upon as to liability; and in the circumstances, I consider it would be invidious to mention names.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 10.

Sulphate of Ammonia.—The firmness of the past few weeks continues, though prices do not advance rapidly. Although consumers bought sparingly throughout February, exports were exceptionally heavy (mainly against contracts previously entered into); and the month closed with practically no stocks in the hands of makers. The lateness of the season has enabled consumers to delay their further supplementary purchasing; but the demand for "covering" purposes is still sufficient to absorb current production, and everything offered has found a ready sale. The closing quotations are £12 2s. 6d. to £12 5s. per ton; and these prices have also been paid for March delivery, f.o.b. at the ports. There has again been considerable interest in the forward position; but the advanced ideas of makers have rather checked business.

Nitrate of Soda is firm in all positions; and spot quotations are 8s. 10¼d. per cwt. for ordinary, and 9s. for fine quality.

LONDON, *March* 10.

Tar Products.—Carbolic acid is easier, and lower prices are prevailing. Pitch is dearer; and makers, being either well sold or oversold, are now asking more money for the remainder of this season. A moderately steady market exists for creosote and other tar oils. Both for crude naphtha, as well as for solvent and heavy naphthas, there is only a poor market; and lower prices are being taken.

The average values obtaining during the week were: Tar, 17s. to 26s. Pitch, east coast, 37s.; west coast, 35s. Benzol, 90's, ordinary, 7d.; special qualities for gas, 8½d.; 50's, 9½d. Toluol, 90's, 1s. 2d.; pure, 2s. Solvent naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 4½d. Heavy naphtha, 1s. Creosote, 3½d. Heavy oils, 3¾d. Carbolic acid, 50's, 2s. 5d.; 60's, 2s. 9d. Crude naphthalene, 60s. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia is firm, and a large business is being done both for prompt and forward deliveries—for prompt, at £12, less 3½ per cent., and for forward some makers would accept a shade less.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Although there is undoubtedly, as reported last week, an easing down in the coal market here, so far as inland trade is concerned, the continued exceptional pressure for shipment more than counteracts any falling off in requirements for home consumption. Any surplus output that collieries have over their local trade, they are readily able to dispose of for shipment at considerably above inland prices; 3s. to 4s. per ton above their list basis pit quotations being generally obtained without difficulty, where they book orders for shipment. This position is not unnaturally a great inducement to colliery proprietors who have any facilities for shipment, to withdraw as much coal as possible from their inland trade; and this is tending to keep up a shortness of supplies, especially in the hard qualities suitable for iron-making, steam, and general manufacturing purposes. The outlook generally may be regarded as not at all a satisfactory one for large users of fuel; and, judging from the present attitude of coalowners, it is evident they anticipate being able to command a very considerable advance over last year's prices on the important gas coal and locomotive fuel contracts that during the next few months will come upon the market. There would seem to be every probability of an exceptionally large shipping demand for the Baltic and the Black Sea, which will practically withdraw any competition with Lancashire for these contracts so far as Yorkshire is concerned; and already the question of the prices that are to be quoted on these contracts has been under consideration. On gas coal contracts, the advance over last year generally talked of is about 4s. to 4s. 6d. per ton—bringing the better qualities of screened gas coal to about 14s. at the pit, which would inevitably lead to a considerable increase in the price of gas to consumers. On locomotive fuel, the advance asked will probably be about 5s. per ton—bringing the prices up to 13s. at the pit; and it is not unlikely that 12s. 6d. may be the minimum figure collieries will agree to accept. As to the general home trade, it may be briefly reported that on house-fire qualities the demand is steadily lessening; but collieries have no surplus supplies to put into stock, and prices are

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exceedingly strong at the list basis. Common round coals are in brisk demand for steam, forge, and general manufacturing purposes; and with supplies restricted by the considerable quantities going away for shipment, it is difficult to place orders at the pit at anything under 12s. 6d. per ton. Slack is not quite so stiff as it has been—at any rate, so far as special prices are concerned—and although Lancashire collieries are mostly still short of slack, consumers are evidently able to cover requirements in other districts, and are not disposed to pay the higher rates that were ruling recently. Good ordinary rough slack does not now average above 9s. 6d. per ton at the pit, with not more than 10s. 6d. obtainable for the best qualities. For shipment, special prices have to be paid; and these still tend upwards—16s. 6d. to 17s. per ton having been obtained during the past week without difficulty for steam coals, delivered at the ports on the Mersey. For coke, there is a continued pressing demand in excess of what makers can produce; but they still hold back from advancing list rates. These, however, are exceedingly firm at about 30s. per ton at the ovens, as the minimum for foundry cokes, and 23s. to 23s. 6d. for furnace sorts.

Northern Coal Trade.—There is a firmer demand for coal, and the shipments have again been very heavy; the arrivals of steamers being numerous. The tendency of prices has thus been rather upwards—more especially when the coal has to be delivered over the whole of the shipping season. Best Northumbrian steam coals are now quoted at 18s. to 19s. per ton f.o.b., with a little variation according to the time of delivery. Second-class coals are about 1s. per ton lower, and for steam smalls the quotation is 11s. to 11s. 6d. The gas coal trade is rather steadier; and several of the contracts for small ports on the Continent are being arranged—the prices under such being somewhere near 15s. per ton f.o.b. The demand for gas coals is still a very large one; and there is not much free coal for occasional sale. But for any such, the price quoted may be about 16s. per ton f.o.b. There should be soon a decrease in the large shipments coastwise of gas coals; but against this will be set some increase in the exports. Coke is very firm, and seems dearer. Gas coke is being rather more heavily exported; but there is not much change in the position in other respects, and prices are unaltered.

Scotch Coal Trade.—There is an easier tone in the market. Supplies are more plentiful; and prices are a shade less. Forward contracting at current rates is, however, common. The prices quoted are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 15s. to 16s., and splint 15s. to 15s. 6d. The shipments for the week amounted to 181,088 tons—a decrease of 16,988 tons upon the previous week, but an increase of 40,727 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,583,502 tons—an increase of 355,781 tons upon the same period of the previous year.

The Sale of Gas in Newcastle.—Despite the increased use of electricity, there is a steady growth in the quantity of gas sold by the Newcastle-on-Tyne and Gateshead Gas Company. In 1888 it was 1,378,453,000 cubic feet; in 1899, 2,373,956,000 cubic feet. There is thus in eleven years an increase of upwards of 72 per cent.

Wellington (Salop) Water Supply.—It has been decided to increase very considerably the storage capacity of the water reservoir of the Wellington Urban District Council at the foot of the Wrekin; and Mr. R. E. W. Berrington, of Wolverhampton, has been selected to carry out the necessary works.

The Newport (I.W.) Town Council and the Gas-Works.—At the meeting of the Newport (I.W.) Town Council last Tuesday, the Mayor (Mr. G. B. Purkis) proposed that the Council should appoint a Special Committee to consider and report as to the advisability of the Corporation taking the necessary steps to obtain statutory powers to purchase the gas undertaking. After some discussion, the proposition was agreed to with two dissentients.

Metropolitan of Melbourne Gas Company.—The gross receipts of this Company for the six months ending the 31st of December last amounted to £155,215, as compared with £146,188 in the second half of 1898. The gross profit was £70,525, against £61,908; and the net amount available for distribution is £38,068, against £34,501. The Directors recommend a dividend at the rate of 8 per cent., after the payment of which there will be a balance of £213.

The New Issue of Brentford Gas Stock.—With reference to the recent announcement in the "JOURNAL" of the withdrawal by the Directors of the Brentford Gas Company of the invitation for tenders for their new issue of 4 per cent. debenture stock, we are informed by the Secretary (Mr. W. Mann) that this step was necessitated by the discovery of the omission of a small formality in the notice convening the meeting on the 11th of February, 1898, at which authority for raising the money by debentures was believed to have been obtained. The invitations for tenders will, he states, be re-issued after a meeting has been duly convened for the purpose.

A Traction Engine Causes a Gas Explosion in Dublin.—What might have been a very disastrous explosion of gas, but which was happily attended by no injury to any person, occurred in one of the sewers in Fish Street, Dublin, last Wednesday. It alarmed the whole neighbourhood, and was sufficiently severe to blow off the cast-iron cover of the manhole, and to considerably disturb the earth around it. It appears that the explosion was due to an escape of gas from a broken main. A heavy traction engine and waggons conveying pipes had previously passed down the street; and it is surmised that the weight of the engine caused the damage to the main.

Coventry Corporation and the North Warwickshire Water Bill.—A conference took place last Thursday between the Parliamentary Agents of the North Warwickshire Water Company and representatives of the Coventry Corporation, with reference to the opposition of the latter to the Bill of the former. Terms were arranged for the withdrawal of the petition of the Corporation. The promoters undertook to strike out the whole or parts of clauses which gave roving powers of which the Corporation complained. They are also to insert in the Bill a clause saving any rights which the Corporation may possess at the present time to sink wells and take water from any area within the Company's limits of supply.

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Prepayment Gas-Meters at Nottingham.—In some notes on the prepayment gas-meter system, a Nottingham paper says: "On an average about £70 a day in pennies passes into the coffers of the Corporation Gas Department as a result of the clearing of the slot meters in the city—a work which is regularly in progress, several collectors being constantly engaged. There are nearly 10,000 of these slot meters in use in the city; and it would no doubt come as a surprise to many did they know the extent to which the occupants of good-class houses avail themselves of this prepayment system. There are also tradesmen who make use of them at their business premises."

The Mutual Gas, Water, and Electricity Supply Company.—The report presented by the Directors of this Company at the meeting of shareholders on the 21st ult. showed that the profits realized on the last financial period amounted to 448,356 frs. (£17,934), which is about the same as before. The principal undertakings in which the Company are interested are the Electricity and Hydraulic Company of Charleroi, the Electric Light Company of St. Petersburg, the Tramways and Lighting Company of Belgrade, the Clausenburg and Oldenburg Lighting Company, and the Vienna, Alicante, and Utrecht Water Companies. The dividend on the preference (500 frs.) shares is 19·25 frs., and on the ordinary shares 9 35 frs.

Wallasey Water Supply.—Mr. R. H. Bicknall held an inquiry at Wallasey last Tuesday week into an application by the District Council to the Local Government Board for permission to borrow £14,000 for works connected with the water supply. It was stated by the Clerk (Mr. H. W. Cook) that the supply of water was scarcely adequate to the demand. From the three stations 1,740,000 gallons could be obtained; but the demand at times exceeded this. The present proposal was to construct two boreholes on the site of the existing well at Liscard—one to be made to a depth of 800 feet, and the other 600 feet, as the result of which a much greater yield of water than at present might be expected. Evidence was submitted in support of these statements.

Failure of the Deep Boring for Water at Margate.—The report of the Borough Engineer of Margate (Mr. A. Latham) proves that the deep boring experiment in search of an adequate supply of water is a failure, and that it will be necessary to look elsewhere for the additional water which is so greatly needed. When the abundance of water found in the greensand turned out to be too salt to use for domestic purposes, it was hoped that a considerable quantity would be obtained from the chalk at a depth of between 400 and 500 feet, where water of excellent quality had been found; and the height to which the water stood in the borehole justified this expectation. Experiments made tended to show that there was sympathy between the water in the well and that in the borehole; but it was hoped that there was sufficient pressure at the lower depth to provide a large additional supply. To put this to the test, the Council decided, at a trifling cost, to connect the borehole and the well, so as to reap any advantage that might be obtainable. The result, however, is a complete failure. The water in the borehole immediately sank to the level of that contained in the well; and there has been no additional flow since.

Faringdon Water Supply.—The Local Government Board having sanctioned the borrowing of £5097 for works of water supply for the town of Faringdon, the Rural District Council have instructed the Engineer, Mr. G. Winship, Assoc.M.Inst.C.E., of Abingdon, to take steps for carrying out the necessary works.

Compensation for Water at Leeds.—At a meeting of the Leeds Water Committee on Friday, it was reported that a settlement had been arrived at with the Trustee of the Farnley Hall Estate—viz., to pay him £11,000 as compensation for the retention by the Corporation of some 6 million gallons of water per day now sent down from the Swinsty to the Lindley reservoir. The sum was fixed as the outcome of arbitration proceedings in which the President of the Institution of Civil Engineers acted as Umpire.

Proposed Extension of the Walsall Corporation Gas-Works.—These works are about to undergo considerable extensions and improvements, to meet the extraordinary growth of the borough, which now numbers upwards of 80,000 inhabitants. The Gas Committee of the Town Council recommend the engagement of an eminent Gas Engineer to report as to the condition of the works and plant, and to advise generally as to what alterations and additions he considers it desirable for the Corporation to carry out in order to increase the make of gas and reduce the cost of production.

The Water Supply of Castle Rising, Norfolk.—Under the direction of Sir Redvers Buller, the Trustee for the estate, works have been carried out to supply the above-named place with water. The water is drawn from the river and raised by means of a turbine driving a set of three-throw pumps; these deliver it through a filter to a cast-iron rising main connected to the pipes in the village. A brick reservoir has been built, of sufficient capacity to hold a supply in case of fire; and mains have been laid to and throughout the village. Mr. Martin W. B. Ffolkes, of Westminster, designed and carried out the whole of the works.

Gas Discounts at Bradford.—At the meeting of the Gas Committee of the Bradford Corporation last Friday, some discussion took place with regard to the discounts allowed upon gas accounts. The present rates range from 2½ per cent. upwards, according to the quantity of gas consumed; and it was urged that a uniform allowance of 2½ per cent. should be adopted, out of consideration for the small consumers. Another suggestion was that the discount system should be abolished altogether, and the gas sold at the lowest possible price. Eventually a Sub-Committee were appointed to consider the matter more fully.

The Southport Corporation and the Water-Works.—The General Purposes Committee of the Southport Corporation have decided that the Parliamentary Bills Committee shall be empowered to pledge the Corporation to bring in a Bill next session to purchase the undertaking of the Southport Water Company, or to constitute a Joint Board, on which they would be represented with the Urban District Council of Birkdale and the West Lancashire Rural District Council, to purchase and carry on the concern; or, with the consent of these Councils, to acquire the undertaking for the benefit of the whole area of supply, or carry it on in conjunction with any of the authorities named.

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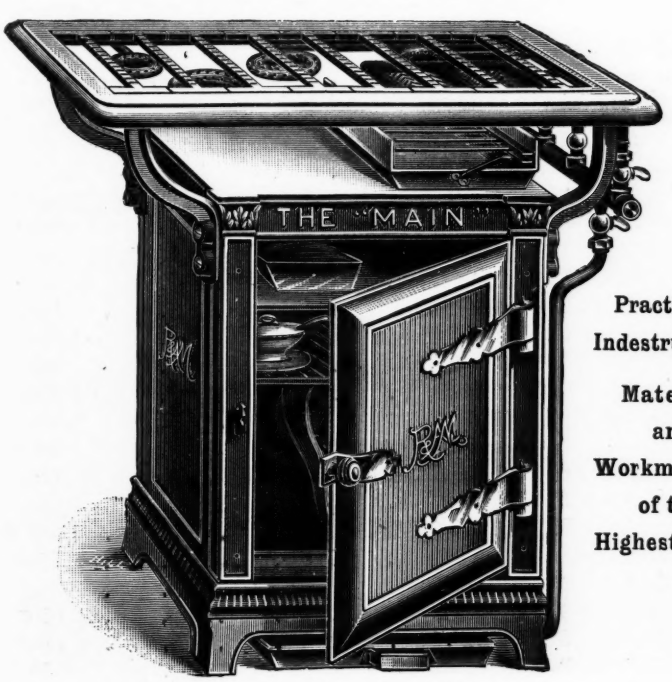

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The Blackbrook Water Scheme of the Loughborough Corporation.—For the construction of the Blackbrook impounding reservoir, the Loughborough Corporation received twelve tenders, the highest of which was £84,812, and the lowest £58,707. The latter, which was submitted by Messrs. H. Fotherby and Son, of Burnley, has been accepted. The time which will be spent in completing the work is estimated at three years. The dam will be 482 feet long, 94 feet wide, and 108 feet to the top of the parapet. The reservoir will be a mile in length, three miles in circumference, and its capacity 510 million gallons. The ultimate cost of the scheme is calculated at about £74,000.

The Exmouth District Council and the Water Company.—A further attempt has been made by the Exmouth District Council to come to an arrangement with the Water Company for the purchase of their works. At a meeting of the Council last Wednesday, it was stated that Mr. Strachan, one of the Engineers acting for them in connection with their Bill, advised that another offer should be made to the Company; and it was resolved that a proposal should be submitted to them for the purchase of their undertaking on the usual compulsory arbitration terms—the Company to be informed that the Council were willing that the Engineers should first meet and endeavour to come to an arrangement, and failing this to go to arbitration.

Visit of the Birmingham Association of Mechanical Engineers to the Saltley Gas-Works.—Last Saturday afternoon, about sixty members of the Birmingham Association of Mechanical Engineers visited the Saltley Gas-Works. They were received by Mr. J. H. Lloyd (Chairman of the Gas Committee) and Messrs. H. Hack (Engineer), Chaney, and Richmond. Mr. Lloyd welcomed the visitors, and the party made a circuit of the whole of the works. The new holder which has lately been completed was greatly admired. At the close of the inspection, the visitors were hospitably entertained by Mr. Lloyd, to whom, as well as to Mr. Hack and his assistants, a vote of thanks was accorded for the able way in which they had explained the working of the different processes connected with gas manufacture. Mr. Lloyd and Mr. Hack suitably responded.

Sevenoaks Water Company's Application for a New Provisional Order.—The Sevenoaks District Council have petitioned against the application of the Water Company for a Provisional Order to confer upon them additional powers; and correspondence has passed between the Board of Trade, the Council, and the Company in regard thereto. From their knowledge of local requirements, the Council seriously doubt whether there is any necessity for empowering the Company to raise such a large sum as £20,000, as proposed; and they deny that the district is rapidly increasing or is large. The Council also emphatically repudiate any intention of attempting to deprive the undertakers of any statutory rights or powers which they did, or should, possess, in order to purchase the concern at a reduced value. They appear to be pained that the Company should attribute to them such a discreditable motive; but, at the same time, they ask that a clause should be inserted in the Order enabling them to buy the undertaking at a fair and equitable, and not at a confiscatory, price.

Newhaven and Seaford Water Supply.—The Newhaven and Seaford Water Company have lately completed, from the designs of Mr. F. S. Courtney, M.Inst.C.E., of Westminster, new works at Poverty Bottom, not a great distance from the first-named town, which, it is estimated, will furnish water for more than three times the present population of the district. The engine-house is 32 ft. by 22 ft., and 18 feet high to the springing of the roof, which is carried by iron girders. Adjoining is the boiler-house, and next to it a workshop; and there is a very commodious coal-store. The pumping machinery is in duplicate, and consists of two inverted vertical compound surface-condensing steam-engines with side-by-side cylinders, 11½ and 18 inches diameter respectively, having a stroke of 20 inches. The cylinders are steam-jacketed throughout. There are two boilers of the Cornish type, each 24 feet long and 5 ft. 9 in. diameter. They are made suitable for a working pressure of 140 lbs. per square inch, and are fitted with Meldrum's patent furnaces, which allow of the use of small or inferior coal. The hot gases, on leaving the boilers, pass through one of Green's economizers, instead of going direct into the chimney.

The Newquay District Council and the Water Company.—Some attempt has been made by the Newquay District Council to open negotiations with the Water Company for the purchase of their undertaking. So far, however, they have not led to any definite result. In answer to a communication from the Council, the Company wrote that they would be willing to consider the question of the sale of the undertaking, and suggested that a deputation should meet representatives of the Company, on the understanding that, if no sale resulted, what passed between them should not be made public. The letter was read at a meeting of the Council yesterday week. Mr. G. F. Nicholls expressed his disappointment that the Company had not named a price, and asked if it was worth while to appoint a deputation. Dr. Norway thought the Company's suggestion fair, and urged the Council to take advantage of it. Every year there were, he said, complaints of the quality of the water; and the Council ought to take steps to improve it. While, however, the water was bad, it was not injurious to health. Mr. Pearce said he had been told that the Company were about to carry out a large scheme, including filter-beds. The Council did not appoint a deputation; and, for the present, the question of the purchase of the undertaking is apparently closed.

The Grantham Town Council, at their meeting last Wednesday, decided not to oppose the Grantham Gas Company's Bill now before Parliament.

The Hartlepool Gas and Water Company's Bill is to be opposed by the Corporation, who propose to ask Parliament, in the event of the Bill passing, to insert a purchase clause.

At the meeting of the Yeadon District Council last Wednesday, a cheque for £300 was signed, in payment of the Council's share of the first instalment of the costs incurred in opposing the Yeadon and Guiseley Gas Company's Bill of last session. The Clerk said the whole of the costs would be less than £1000, of which Yeadon's share was a little more than half.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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W. H. PEARSON, Junr., Deputy-Chairman.
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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Second Contract)	250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	BUFFALO, N.Y.	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	WINNIPEG, MAN.	500,000
COLCHESTER	300,000	COLCHESTER (Second Contract)	300,000
BIRKENHEAD	2,250,000	YORK	750,000
SWINDON (New Swindon Gas Co.)	120,000	ROCHESTER	500,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	KINGSTON, ONT.,	300,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000	CRYSTAL PALACE DISTRICT	2,000,000
HALIFAX	1,000,000	DULUTH, MINN.	300,000
TORONTO	250,000	CATERHAM	150,000
OTTAWA	250,000	LEICESTER	2,000,000
LINDSAY (Remodelled)	125,000	ENSCHEDE (HOLLAND)	150,000
MONTREAL	500,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
TORONTO (Second Contract; Remodelled)	2,000,000	BURNLEY	1,500,000
BELLEVILLE	250,000	KINGSTON-ON-THAMES	1,750,000
OTTAWA (Second Contract)	250,000	ACCRINGTON	500,000
BRANTFORD (Remodelled)	200,000	TONBRIDGE	300,000
ST. CATHERINES (Remodelled)	250,000	STRETFORD	500,000
KINGSTON, PA.	125,000	OLDBURY	300,000
PETERBOROUGH, ONT.	250,000	TODMORDEN	500,000
WILKESBARRE, PA.	750,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000

Plans have been approved of the buildings for the water-gas plant at the Lincoln Corporation Gas-Works.

In view of the high price of coal, the Ripon City Council have decided not to supply gas free for exhibitions of gas appliances.

Mr. A. E. Young, the Secretary of the Hastings and St. Leonards Gas Company, has received an addition of £50 a year to his salary.

A successful exhibition of gas appliances by Messrs. John Wright and Co., at the Railway Hotel, Mayfield, was brought to a close last Friday. Miss Ball gave a cookery demonstration.

Last week, the Davis Gas-Stove Company held an exhibition of gas appliances in the Ford Memorial Hall, Bristol; Miss Amy Wilkinson giving cookery demonstrations twice daily.

The higher-priced coal which the Todmorden Corporation Gas Committee have had to use owing to the scarcity has increased the cost of gas production by 1¼d. per 1000 cubic feet.

The Leeds Fire-Clay Company, Limited, have obtained orders for their regenerator settings, complete with ironwork, for the Richmond (Surrey), Birstall, and Hoylake and West Kirby Gas-Works.

The Leeds City Council have sanctioned the acceptance by the Gas Committee of a tender for the erection of a new retort-house at the York Street works. The amount of the contract is £4653.

The three Station Managers of the Leeds Corporation Gas Department have been voted substantial additions to their salaries. Mr. George Tooley, the Manager of the Meadow Lane works, and Mr. John Bond, the Manager of the New Wortley works, are to receive an extra £100 per annum, and Mr. Walter E. Pettigrew, the Manager of the York Street works, £50.

About sixty students attending the chemistry classes conducted by Mr. W. Marshall at the Rochdale Technical School recently paid a highly instructive visit to the Rochdale Gas-Works. Mr. T. Stenhouse, the Borough Analyst, met the party, and for nearly two hours was unwearying in showing and explaining the working of the various appliances used in the manufacture of coal gas and the treatment of the residual products.

The Newcastle-upon-Tyne Gas Company have placed an order for a complete coke-handling plant, including two long retort-house conveyors, on the De Brouwer system, with hoppers and screening plant, with Messrs. W. J. Jenkins and Co., Limited, of Retford, the sole makers.

The Progressive party on the London County Council have elected Mr. Alderman Dickinson, the Chairman of the Water Committee, as Chairman of the Council, in succession to Lord Welby, whose term of office expires this month; Mr. A. M. Torrance being chosen to fill the position of Vice-Chairman. The selection of the Deputy-Chairman was, as on former occasions, left to the Moderate party; and they have nominated Mr. J. S. Fletcher, who represents Hampstead.

A very successful exhibition of gas appliances, held by Messrs. Richmond and Co., Limited, in the Public Hall, Croydon, was brought to a close last Wednesday. It had been opened some days previously by Alderman Rymer, J.P., a Director of the Bournemouth and Worthing Gas Companies. It comprised a large number of Messrs. Richmond's cooking and heating stoves and appliances of all kinds; and Messrs. Hammond and Hussey had a stall containing stoves, gas-brackets, incandescent burners, pottery, asbestos stoves, &c.

The annual meeting of John Wright and Co., Limited, was held at the Grand Hotel, Birmingham, last Thursday—Mr. S. Sanders presiding. In moving the adoption of the report, noticed last week, the Chairman pointed out that the Directors felt justified in paying an increased bonus this year, although they had had considerable expenses, consequent on the increasing demand for their manufactures. Additions had had to be made to the works during 1898 and 1899 at a cost of £7000, so rapidly was their trade developing. They had £30,000 in 5 per cent. debentures, all of which were redeemable at £105; but they had outside investments in first-class stocks amounting to £60,000, and they proposed to wipe out all their debentures in due time. The Directors had been asked to support the Birmingham University scheme; and, under the circumstances, he thought the £500 proposed was a handsome donation, but he did not believe any shareholder would regard it as extravagant. The motion was carried; and it was resolved that the dividends recommended be paid.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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Resists 4500° Fahr. Best for use in GAS-WORKS.
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Correspondence invited.

ENRICH your Gas with cheap Benzol.
Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.
Apply to SADLER AND CO., MIDDLESBROUGH.

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SULPHATE OF AMMONIA SATURATORS.

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Telegraphic Address: "SATURATORS, BOLTON."

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Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, See March 6, p. 640.]

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Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

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Information and Handbook on application.
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HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
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INCREASE the efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
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OXIDE OF IRON BOG ORE.

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NEWPORT (MON.) GAS COMPANY.
WANTED, a Junior Draughtsman.
Apply to the undersigned, stating Age, Experience, and Salary required, with *copies* of not more than three recent Testimonials, on or before the 17th of March next.
THOMAS CANNING,
Engineer and Manager.
Engineer's Office, Newport, Mon.,
March 2, 1900.

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PATENTEE is desirous of meeting a Gentleman with few hundreds CAPITAL TO WORK NEW GENERATOR. One of the Safest and Cheapest Systems in the Market. Several inquiries already received. Active interest if desired.
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WANTED, a Meter Inspector and Slot Meter Collector, able to do general Gas-Fitting and advise Consumers.
Apply, stating Age, Experience, and Wages required, to Mr. BUCKLEY, Gas-Works, FALMOUTH.

YOUNG Man wanted for Stoves, Meters, and Incandescent Burners, by a Gas Company in Essex. Must be thoroughly reliable and steady. Good Wages.
Apply, by letter, to No. 3449, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a first-class Sulphate MAKER. Must have experience with Schwab's Sulphate Plant. Must be steady and reliable. Wages 35s. per week.
Apply, by letter, to No. 3447, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LEADING Stoker wanted in a Gas- Works, near London, making 60 millions. Must be used to Engine and Boiler and Regenerative Furnaces. Good Wages to a steady, reliable Man. Twelve-hour Shifts.
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WANTED, a good Fitter thoroughly competent to take entire charge of Main Laying Department. A man having a knowledge of Internal Gas-Fitting preferred. Wages 36s. per week.
Apply, with References, to Mr. JOS. HARGER PYE, Gas-Works, Clevedon, SOMERSET.

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WANTED, by the Tynemouth Gas Com- pany, a RETORT-HOUSE FOREMAN. Wages £2 8s. per week.
Particulars from the undersigned, to whom applications should be forwarded.
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Engineer.

WANTED, a Young Gas-Fitter of good address to act as METER INSPECTOR and SLOT METER COLLECTOR, filling up spare time in fixing Cookers, attending to Incandescent Lamps, and general House Fitting. An Abstainer preferred.
Apply, with Testimonials, and stating Wages required, to No. 3441, care of Mr. King, 11, Bolt Court FLEET STREET, E.C.

URBAN DISTRICT COUNCIL OF PONTYPRIDD.
(GAS DEPARTMENT.)

THE Urban District Council of Ponty- pridd are prepared to receive APPLICATIONS for the position of ENGINEER and MANAGER of their Gas-Works. Candidates must possess a thorough knowledge of the Manufacture and Distribution of Gas on the most modern principles. The person appointed must devote the whole of his time to the duties, which will include the preparation of all Books appertaining to the Management. Age not to be under 25 years, or over 45 years.
Salary at the rate of £3 10s. per week, with House, Coal, Gas, and Rates and Taxes free.
Applications, in Candidates' own Handwriting, accompanied by *copies* of three recent Testimonials, to be forwarded to me, the undersigned, marked "Manager," not later than Monday, the 19th day of March, 1900.
Canvassing will be de med a disqualification.
MONTAGUE H. GROVER,
Clerk to the Council.
Council Offices, Pontypridd,
March 2, 1900.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

APPOINTMENT OF ASSISTANT ENGINEER.

THE above Company require an As- SISTANT ENGINEER. He must be a good Draughtsman, and have had experience in the management and control of Workmen and Regenerative Firing. He must further be able to undertake the complete Testing and Analysis of Gas and the general routine of a Gas-Works.
Applicants to be between 21 and 35 years of age. The gentleman appointed will be required to reside in the neighbourhood of the Works.
The Salary will commence at from £150 to £200 per annum.
Applications to be by Letter, stating Age, Qualifications, and Experience, whether Married or Single, and date on which duties could be commenced, and must be accompanied by *copies* of three recent Testimonials, and be delivered not later than Friday, the 6th of April, 1900, addressed to the Chairman of the Company, and marked on cover "Assistant."
A. E. BROADBERRY,
Engineer and Manager.
Gas-Works, Tottenham,
March 7, 1900.

WANTED, by the Alton Gas and Coke Company—
Two First-Class PURIFIERS, 12 ft. to 15 ft. square, with Grids and Lifting Gear complete.
Also a good Second-Hand ANNULAR CONDENSER, with Valves and Connections complete.
All communications to be sent to F. BARNLEY, Manager, Gas-Works, Alton, HANTS.

GAS-FITTER & MAIN & SERVICE LAYER.

WANTED, for a Provincial Gas Com- pany, a competent and reliable Man, with knowledge of fixing Gas-Stoves, Incandescent Burners, &c. A permanent acceptable Situation for a good, steady Man.
Apply, by letter, stating Age and Experience, to No. 3448, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF ABERAVON.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive Applications for the position of ENGINEER and MANAGER of their Gas-Works. Candidates must possess a thorough knowledge of the Manufacture and Distribution of Gas. The person appointed must devote the whole of his time to the duties, which will include the preparation of all Books appertaining to the Management. Age not to be under 25 Years or over 45 Years. Salary at the rate of £2 10s. per week, with House, Coal, Gas, and Rates and Taxes free.
Applications in Candidates' own Handwriting, accompanied by *copies* of three recent Testimonials, to be forwarded to me, marked "Manager," not later than Saturday, the 31st of March inst.
Canvassing will be a disqualification.
By order,
M. TENNANT,
Town Clerk.
Aberavon, March 6, 1900.

WANTED, Four second-hand Purifiers, in good condition, about 20 feet square by 5 feet deep, with Covers.
Address, stating Price, and where they can be seen, No. 3451, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINES and Exhausters, from 1500 to 60,000 cubic feet of gas per hour, in Stock, ready for delivery. No reasonable offer refused.
J. F. BLAKELEY, Thornhill, DEWSBURY.

CAST-IRON Tank, 70 ft. diameter by 20 ft. deep (capacity 481,000 gallons) FOR SALE. Very cheap to clear at once.
Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

LIVESEY Washer, 1 Million per diem, 18-inch Valves. MORRIS & CUTLER'S CONDENSER, 18-inch Valves. All in perfect order, and cheap.
J. F. BLAKELEY, Thornhill, DEWSBURY.

FOR SALE, by order of the Directors of the Blackwater Gas Company, a GASHOLDER, 6000 cubic feet capacity. Now working; to be removed owing to Extensions.
Full Particulars from GEO. MEAD ROBINS, Sutton, SURREY.

THE Bedford Gas Company have a quantity of Cast-Iron STREET-LAMP COLUMNS, with Cradles and Ladder Irons, FOR DISPOSAL at a low rate.
THOS. DANN,
Manager.

BOILER Tanks, several good ones. CAST SCRUBBER, 10 feet diameter by 20 feet (would make splendid Tank); also others. Two VERTICAL ENGINES. ROTARY EXHAUSTERS. Cheap to clear.
FIRTH BLAKELEY, Thornhill, DEWSBURY.

FOR SALE—Two Lancashire Boilers, each 6 ft. diameter by 20 ft. long, with Mountings. Been in use only a short time. Made by the Yorkshire Engine Company, Limited, Sheffield.
Apply to NEWTON, CHAMBERS, & Co., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD, where the Boilers may be seen.

THE Corporation of Liverpool have for DISPOSAL a large number of Modern 14-inch Square LAMPS, Copper built throughout, with plain Glass Sides, and Opal Glass Tops, for use in Cradles or on Legs. They are in good repair; a large number of them being practically equal to new.
A Sample will be sent on application, and a Low Price accepted.
C. R. BELLAMY,
City Lighting Engineer.
Hood Street, Liverpool.

HARROW AND STANMORE GAS COMPANY.

FOR SALE—Three 8 feet square PURIFIERS, with 8-inch Valves and Connections, and with Travelling-Crane.
Four 8 feet Square PURIFIERS, with Centre-Valve, complete with Connections.
A STATION METER, 1500 cubic feet.
A small ENGINE and EXHAUSTER, with Boiler.
Application to be made to the undersigned.
JAMES L. CHAPMAN
Gas-Works, Harrow.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BOROUGH OF NELSON.

THE Gas Committee invite Tenders for the supply of BRASS FITTINGS and IRONMONGERY for Twelve Months.
Form of Tender, with Particulars, can be had on application to Mr. A. Allan, Gas Engineer, and Samples may be seen at the Gas-Works.
Sealed Tenders, duly endorsed, must be sent to me, the undersigned, not later than the 20th of March.
R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
March 7, 1900.

NELSON CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR ENGINE AND EXHAUSTER.

THE Gas Committee invite Tenders for the supply and erection of an ENGINE and EXHAUSTER at their Brierfield Works.
Full Particulars may be obtained on application to Mr. A. Allan, Gas Engineer, Nelson.
Sealed Tenders, marked "Tender for Engine and Exhauster," to be sent to me, the undersigned, on or before the 13th of March, 1900.
R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
Feb. 28, 1900.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee are pre- pared to receive TENDERS for the supply of LIME, SULPHURIC ACID, WROUGHT-IRON TUBES, GAS and WATER FITTINGS, OIL and PAINT, IRONMONGERY, LEAD PIPE, STATIONERY, &c., as may be required for the Half Year ending the 30th of September, 1900.
Further Particulars and Forms of Tender may be obtained on application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre R.S.O., Glam.
No Form of Tender other than that issued by the Committee will be accepted.
Tenders, endorsed "Contract 1, 2, &c.," as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before Wednesday, the 21st inst.
The Committee do not bind themselves to accept the lowest or any Tender.
WALTER H. MORGAN,
Clerk.
Council Offices, Pentre R.S.O., Glam.,
March 6, 1900.

BOROUGH OF DARLINGTON.

TO COLLIERY PROPRIETORS.

THE Gas-Works Committee of the Darlington Corporation invite TENDERS for the supply of 35,000 Tons of Screened GAS COAL, delivered at their Gas-Works Railway Siding, during Twelve Months commencing the 1st of April next, in such quantities as may be from time to time required by the Gas-Works Engineer.
The Coal proposed to be supplied must be of the best description for Gas Making, free from all Impurities, and to the satisfaction of the Gas Engineer.
The Committee reserve the right of accepting a Tender for the whole or any portion of the quantity of Coal tendered for.
Tenders, endorsed "Tenders for Gas Coal," and addressed to the Chairman of the Gas-Works Committee, Town Hall, Darlington, must be sent in not later than the 22nd inst.
No pledge is given that the lowest or any Tender will be accepted.
HY. G. STEAVENSON,
Town Clerk.
Darlington, March 6, 1900.

BOROUGH OF RICHMOND, SURREY.

WATER-WORKS AND PUBLIC BATHS.

TENDERS FOR WELSH SMOKELESS STEAM COAL.

THE Town Council for the Borough of Richmond, Surrey, invite TENDERS for the supply of about 1800 Tons of best WELSH SMOKELESS STEAM COAL, to be delivered in Barges of about 40 Tons alongside the Wharf, opposite the Water-Works, Richmond, for One Year, from March 31, 1900. The Seam and District from which the Coal is to be supplied must be stated in the Tender.
Particulars and Forms of Tender can be obtained of Mr. W. G. Peirce, Engineer at the Water-Works. No Tender will be recognized unless it is made on the prescribed form, properly filled up in every respect, and no Expenses or Claim will be allowed or paid to any person whether tendering or not. The Security stipulated by the Public Health Act, 1875, for the due performance of the Contract, will be required. The Contract and Bond will be prepared by the Town Clerk.
Sealed Tenders, endorsed "Tender for Welsh Coals," and addressed to the Chairman of the Water Supply Committee, Borough of Richmond, Surrey, must be delivered at the Town Clerk's Office by Ten o'clock on Monday, the 26th of March, 1900.
The Council do not bind themselves to accept the lowest or any Tender.
FREDK. B. SENIOR,
Town Clerk.
Town Clerk's Office, Town Hall,
Richmond, Surrey, March 5, 1900.

SOUTHPORT CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for the supply of GAS OIL for the Manufacture of Gas.

Specification and Particulars may be obtained on application to the undersigned, to whom Tenders must be sent not later than Monday, March 19, 1900.

JOHN BOOTH,
Engineer.

Southport, Feb. 26, 1900.

BOROUGH OF LONGTON.

TENDERS FOR GAS COAL.

THE Corporation Gas and Electric Lighting Committee invite TENDERS for the supply of GAS COAL.

Specification and Form of Tender may be obtained on application to the undersigned.

Tenders to be sent in not later than Noon, Monday, March 19, addressed to the Chairman of the Committee, and endorsed "Gas Coal."

W. LANGFORD,
Engineer and Manager.

Gas-Works, Longton.

BOROUGH OF CHORLEY.

THE Corporation invite Tenders for the supply of 48 D-shaped RETORTS, 21 in. by 15 in. by 10 ft. long, and sixteen 22 in. by 16 in. by 10 ft. long.

Any further Information may be obtained on application to the Gas Manager, Gas-Works, Chorley.

Tenders, endorsed "Retorts," to be sent to me, on or before Tuesday, the 20th inst.

The lowest or any Tender not necessarily accepted.

By order,
JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
March 9, 1900.

EAST RETFORD CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above are prepared to receive TENDERS for the supply of the whole or part of 6000 Tons of best screened GAS COAL or NUTS, to be delivered as may be required during the Year ending April 30, 1901, at the Sidings of the G.C. or G.N. Railway Companies, Retford.

Forms of Tender and any further Information may be had on application to the undersigned.

Tenders, sealed and endorsed "Tender for Coal," to be sent in addressed to the Chairman of the Gas Committee, on or before the 31st inst.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Office,
Retford, March 10, 1900.

MORECAMBE GAS AND LIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 10,000 Tons per annum of screened GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in such quantities as may be required during a period of One, Two, or Three Years.

Tenders, specifying the description of Coal, the name of the Pit at which it is raised, and the Terms for net monthly payments, are to be sent in on or before Wednesday, the 28th of March, 1900, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any Tender.

WILLIAM DUFF,
Secretary and Manager.

Market Street, Morecambe,
March 9, 1900.

COWES URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR PURIFIERS.

THE Gas Committee invite Tenders for the supply and erection, at the Gas-Works, Cowes, of Two PURIFIERS, 20 ft. by 20 ft., with 12-inch Connections and Centre or Four-Way Valves, complete with Lifting Apparatus, Rails, &c.

Sealed Tenders, endorsed "Tender for Purifiers," and accompanied by Tenderer's own Plans, Specifications, and full Particulars, to be delivered to the undersigned not later than Thursday, March 22.

The Council do not bind themselves to accept the lowest or any Tender.

WILLIAM HALLIDAY,
Secretary.

40, High Street, Cowes, I.W.

CITY OF LEEDS.
(GAS DEPARTMENT.)

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the supply of DRY GAS-METERS, to be delivered at their Meter-Stores, during a period of Twelve Months from receipt of Order.

Each party tendering is required to send on or before Monday, the 19th inst., two sample Three-Light Meters (one of which is to be open for examination), addressed to the Gas-Meter Works, Meadow Lane, Leeds.

Forms of Tender may be obtained on application to the undersigned, at the Offices of the Gas Department, Municipal Buildings, Leeds.

Endorsed Tenders, addressed to the Chairman of the Gas Committee, at the latter address, will be received not later than Monday, the 26th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Municipal Buildings, Leeds,
March 10, 1900.

URBAN DISTRICT COUNCIL OF PADIHAM.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the above Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR, to be produced at their Gas-Works during the Year ending March 31, 1901.

Sealed Tenders, addressed to the Chairman, Gas Committee, must be sent to me, not later than Monday, March 19, 1900; and for Particulars apply to the undersigned.

J. R. SMITH,
Clerk to the Council.

Padiham, March 1, 1900.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Committee invite Tenders for the supply of about 800 Feet of Stourbridge, or other approved quality, FIRE-CLAY RETORTS, 22 in. by 16 in., 200,000 FIRE-BRICKS and TILES, and 50 Tons of CLAY.

Tenders to be sent in on before or Ten a.m. on Monday, March 19, addressed to the Chairman of the Gas and Water Accounts Committee, Boundary Road, Ramsgate, and endorsed "Tender for Fire-Clay Goods."

The Committee do not bind themselves to accept the lowest or any Tender.

Specification and full Particulars on application to

WILLIAM A. VALON,
Engineer.

BOROUGH OF COLNE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the surplus TAR made at their Works during the Year ending March 31, 1901.

The estimated quantity is 800 Tons, which will be delivered into the Contractor's Tanks at Colne Station. (Lancashire and Yorkshire and Midland Railways.)

The offers to be strictly net cash in One month.

Tenders, endorsed "Tar," to be delivered to the undersigned on or before Saturday, the 24th day of March, 1900.

FRED. THORPE,
Engineer and Manager.

Gas-Works, Colne, Lancs.,
March 7, 1900.

BOROUGH OF DARWEN.

TENDERS FOR CANNEL COAL.

THE Corporation are prepared to receive TENDERS for the supply of CANNEL COAL, for One, Two, or Three Years, to be delivered at the Gas-Works Siding in the Corporation Waggons.

Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Cannel Coal," must be delivered to the undersigned at or before Noon, on Thursday, the 22nd day of March, 1900.

No Tender necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Office, Darwen,
March 2, 1900.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply and erection of the following PLANT at their Grimesthorpe Works:—

One 9-inch CAST-IRON CONDENSER, 76 ft. long, 19 ft. high, and 11 ft. wide, with 30-inch diameter. Connections, and Supporting Girders.

30 STEEL and CAST-IRON COKE-HOPPERS for front of Retort-Bench.

Drawings may be seen, and Specifications and Quantities obtained, on application to the Company's Engineer, Mr. J. W. Morrison, on and after the 20th inst.

Sealed Tenders, marked "Condensers," "Coke-Hoppers," must be delivered to the undersigned by post not later than the first post on Monday, April 2, 1900.

The Directors do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street,
Sheffield, March 10, 1900.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 5th of April, 1900, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCKS WILL BE CLOSED from the 22nd of March inst. to the 11th of April inclusive, and RE-OPENED on the 12th of April, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate Street, E.C.,
March 7, 1900.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 21st inst., at Half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 10th and RE-OPENED on the 22nd inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 2, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PLYMOUTH AND STONEHOUSE GAS COMPANY.

NEW ISSUE OF £4000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

£4500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 20, at Two, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Estate of George Stevens, Esq., deceased.
WORTHING GAS COMPANY.

£100 STOCK AND 13 £10 SHARES.

MR. ALFRED RICHARDS will include THE ABOVE in the SALE at the Mart, on Tuesday, March 20.

Particulars of the AUCTIONEER, as above.

By order of the Directors of the
BRIGHTON AND HOVE GENERAL GAS COMPANY.

£10,000 FOUR PER CENT. PREFERENCE STOCK,

Offering to Trustees and others an Investment of the soundest character.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, March 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.
STANDARD DIVIDEND 7 PER CENT.; LAST DIVIDEND £5 12s. PER CENT.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 3rd of April, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £15,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

IN pursuance of the Tottenham and Edmonton Gas Act, 1898, Notice is Hereby Given that it is the intention of the Directors of this Company to Sell by Tender £15,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, to be paid up in full on or before the 30th day of April next; such Stock being a portion of Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of Proprietors held on the 24th day of February, 1900, under the powers of the above-mentioned Act.

Particulars, Conditions, and Form of Tender may be obtained on application at this Office; and Sealed Tenders must be sent in not later than Four o'clock in the afternoon on Tuesday, the 10th day of April next.

By order of the Directors,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
March 2, 1900.

WEST MIDDLESEX WATER-WORKS COMPANY.

ISSUE OF £100,000 THREE POUNDS PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above Issue, being a further portion of the £440,000 DEBENTURE STOCK created under the West Middlesex Water-Works Act, 1894, bearing Interest at £3 per cent. per annum, and redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.

Tenders must be delivered at the Company's Office, No. 19, Marylebone Road, N.W., not later than Eleven a.m. on Tuesday, the 20th of March next.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Office, or will be forwarded on application.

By order of the Board of Directors,
F. H. WYBROO,
Chief Clerk and Secretary.

No. 19, Marylebone Road, N.W.,
Feb. 29, 1900.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF 3½ PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that the Directors have instructed Mr. ROBERT MACK, Auctioneer, to SELL BY AUCTION at the Offices of the Company, Grainger Street West, Newcastle-upon-Tyne, on Wednesday, the 28th of March, 1900, at Twelve o'clock noon, £13,000 of the NEWCASTLE-UPON-TYNE and GATESHEAD GAS DEBENTURE STOCK (perpetual), bearing Interest at the rate of £3 10s. per cent. per annum.

For Conditions of Sale and further Particulars, apply to the undersigned.

(Signed) THOS. WADDOM, Secretary.

Feb. 28, 1900.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO be Sold by Auction, in the Board- Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 20th of March, 1900, at Half-past Twelve o'clock precisely, by Mr. CHARLES A. JOEL, in such Lots as are provided for in the said Company's Act of 1894—

FORTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894).

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH, Secretary.

Newcastle-on-Tyne, Feb. 7, 1900.

By order of the Directors of the

CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE OF £5000 CONSOLIDATED "B" ORDINARY STOCK, AND £2500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. HOOKER & WEBB have received instructions to SELL BY AUCTION, at the Greyhound Hotel, Croydon, on Thursday, March 15, at Five o'clock precisely, in 85 Lots,

£5000 CONSOLIDATED "B" ORDINARY STOCK AND £2500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK

of the Croydon Commercial Gas and Coke Company. The Dividend paid on the "B" Stock for some years has been at the rate of £11 per cent. per annum. The Sale therefore offers an unusually good opportunity for absolutely safe investment in a first-class security.

The Stock will be divided into Lots of £100 and £50 each for the convenience of purchasers.

Particulars and conditions of Sale may be obtained of Mr. W. J. RUSSELL, the Secretary, at the Offices of the Company, Katherine Street, CROYDON; of Messrs. BLYTH, DUTTON, HARTLEY, and BLYTH, Solicitors, 112, Gresham House, LONDON, E.C.; and of the AUCTIONEERS 4, High Street, CROYDON.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

LONDONDERRY GAS COALS

FROM THE

LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

Just Published, Price 1s. 1d., post free, in Khaki Cover.

PERSONAL EXPERIENCES
IN
SOUTH AFRICA,
WITH
SOME REFLECTIONS APPROPRIATE TO THE OCCASION.

By THOMAS NEWBIGGING.

MANCHESTER: R. S. CHRYSTAL, Market Street.
LONDON: GAY & BIRD, Bedford Street, Strand.

The Proceeds to be given to the War Fund.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HARDMAN & HOLDEN, LD.

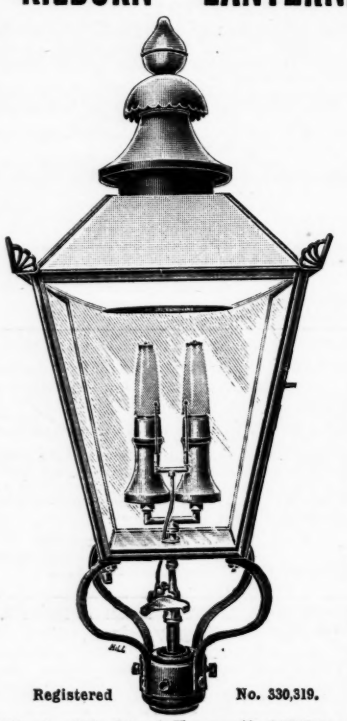
ESTABLISHED 1820.

SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER
Inquiries Solicited.

THE
"KILBURN" LANTERN.



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Fitted with Steel Enamelled White Reflector.

H. GREENE & SONS, LTD.
19, FARRINGDON ROAD, E.C.
Telephone: 1215 HOLBORN. Telegrams: "LUMINOSITY."

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21 JOHN STREET, ADELPHI, LONDON, W.C.

IMPORTANT NOTICE.

All **DEALERS** and the **PUBLIC** are warned against purchasing **WHITE MANTLES** made or sold by the New Sunlight Incandescent Company, Limited. Mantles of a similar make have been held by Mr. Justice Buckley to be **INFRINGEMENTS** of Letters Patent No. 3592 of 1886, owned by the Welsbach Company; and the predecessors of the New Sunlight Incandescent Company, Limited, were ordered to pay damages and costs as between Solicitor and Client. An Action in respect of the above Patent is now pending against the New Sunlight Company, who are to keep an account of all their Sales in accordance with an order of the Court.

The Welsbach Company are advised that **THESE MANTLES ARE ALSO INFRINGEMENTS** of a later Patent, No. 124 of 1893; and they have brought an Action upon this Patent to enforce their Rights.

USERS ARE EQUALLY LIABLE WITH DEALERS.

THE

WELSBACH INCANDESCENT GAS-LIGHT CO.,

LIMITED,

76-80, YORK STREET, WESTMINSTER, LONDON, S.W.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad Street, E.C.

THOMAS TURTON
AND SONS, Limited,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

NITRATE of Thorium and Cerium.
Fabrik Chemischer Praeparate von Sthamer, Noack, and Co., Hamburg.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.
Telegraphic Address: "PARKINSON, NEWCASTLE."

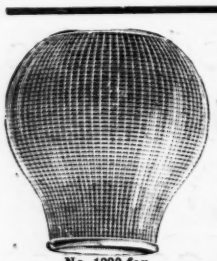
NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.


No. 1390 for
KERN BURNER No. 4.

AN IMMENSE IMPROVEMENT
Has been made in the method of Manufacturing the
"HOLOPHANE" PATENT LIGHT DIFFUSING GLOBES.
The Globes are now MUCH LIGHTER in weight, MORE ARTISTIC in design, and MORE EFFICIENT in light control. An entirely new Series of Patterns. Send post-card for new Catalogue to
"HOLOPHANE" Ltd., 146A, Queen Victoria St., London, E.C.

JOHN BROWN & CO., Ltd., SHEFFIELD,
Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
TELEGRAMS: "ATLAS, SHEFFIELD."

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

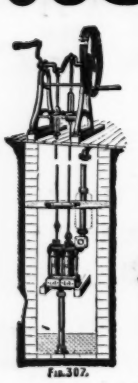


Fig. 307.

PLEASE APPLY
FOR CATALOGUE No. 8.

Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7089.

TRADE MARK.

FIRST AWARDS EVERYWHERE.

Fig. 1A.

Fig. 94.

Fig. 46.

Fig. 185.

Fig. 550.

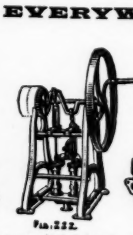


Fig. 232.

Fig. 256.

Fig. 69.

Fig. 198.

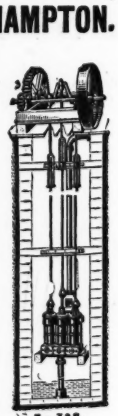
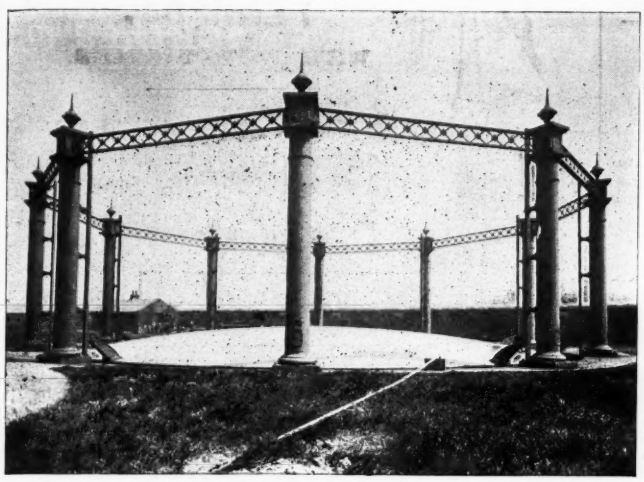


Fig. 328.

See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

GASHOLDERS



A GASHOLDER

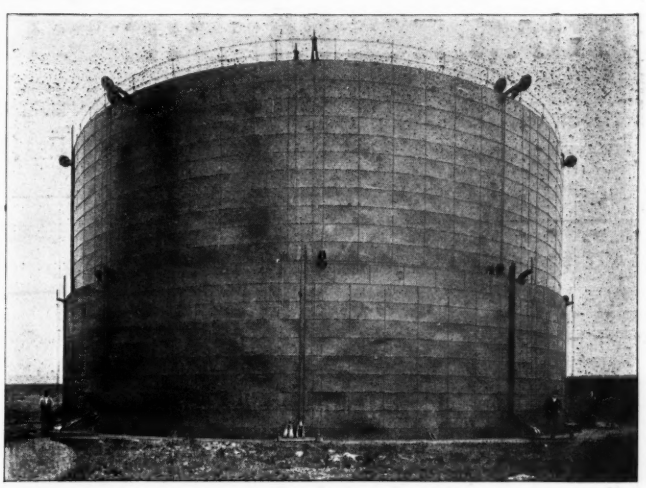
Guided by Ten massive Cast-Iron Columns and Girders is shown in the accompanying Photo.

AS IT WAS

originally erected by us

IN 1883.

We last year took down the Guide Framing, converted the Holder into a Two-Lift; and this Photo. ☛ shows it



AS IT IS NOW

entirely guided by our Patent Steel Cable System.

In many other instances, Columns have een sold and replaced by our Cables.

We are prepared to alter any Holders in a similar manner to the above. Engineers who have trouble with the irregular working of Column-Guided Holders will find the Cable System vastly superior and quite reliable.

PATENTEES AND SOLE MANUFACTURERS:

ASHMORE, BENSON, PEASE, & CO., LTD.

GAS AND ELECTRICAL ENGINEERS,

MANUFACTURERS OF

Accumulators, Complete Installations for Light and Power, Gasholders (with and without Columns), Purifiers, Scrubbers, Condensers, Washers, Roofs, Girders, Sulphate Plants, Valves, &c., &c.

London Office: 181, QUEEN VICTORIA STREET, E.C.

Telegrams: "Gasholder, Stockton-on-Tees." "Apparatus, London."

Paris Office: 3, SQ. DES BATIGNOLLES.

OSLER,
BIRMINGHAM.

MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, March 6, p. 587.]

BEST & LLOYD
MAKERS OF THE **Limited, BIRMINGHAM.**

PATENT "SURPRISE" PENDANT,
WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.

"IN CONJUNCTION WITH
THE INCANDESCENT GAS-LIGHT
it quite **supersedes** the familiar three-light pendent. We are able to bear witness to the **convenience** of the New Pendant."

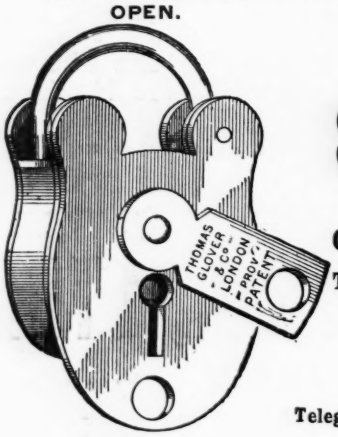
JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.

ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

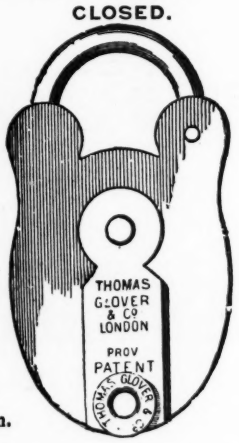
OPEN.



THOMAS GLOVER & CO.'S
PATENT
SECURE PADLOCK
PREVENTS TAMPERING WITH THE
CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,
DRY GAS-METER MANUFACTURERS,
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 28, BATH STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 1805.**

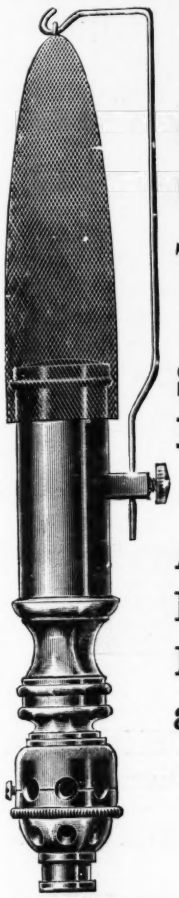
BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 3398.**

GLASGOW: 69-71, McALPINE STREET. *Telegraphic Address: "GASMAIN."* **Telephone No. 6107.**

THE

INTENSIFIED GAS LIGHT COMPANY, LTD.



HIGH-PRESSURE PATENTS.

300 CANDLES PER BURNER

Three Burners consuming 30 cubic feet per hour give a Light of 1000-Candle Power at half the cost of Electric Light.

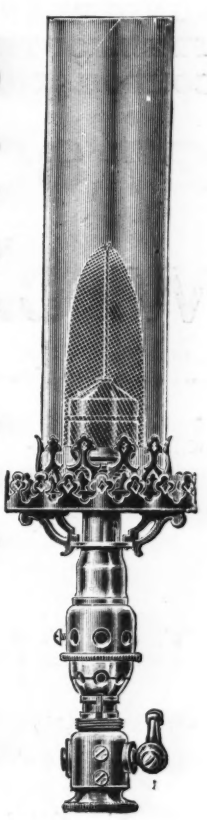
Specially adapted for Lighting Railway Stations, Docks, Sheds, Workshops, Streets and Squares, Shop Windows, &c., &c.

Adopted by the L. & N.W. and Great Central Railways at their Euston and Marylebone Termini, the Crystal Palace, London Pavilion, Mersey and Leith Dock and Harbour Boards, Edinburgh and Leeds Gas Committees, &c., &c., &c.

Specially Low Terms to Gas Companies for Trial Installations.

"The perfection of artificial lighting on the large scale."—"*Journal of Gas Lighting*," April 18, 1899.

ORDINARY GAS PRESSURE PATENTS



The Intensified Company's Improved Incandescent Burner gives **25 CANDLES PER FOOT**, or 60 Candles for $2\frac{1}{2}$ feet. No other Burner on the Market can compare with this. Price, with Mantle and Chimney, from 6s. 6d. Send for Complete Lists.

The most Effective and Economical Burner on the Market for both Indoor and Outdoor Lighting. Mantles specially manufactured for the Company, for both Systems, by the Welsbach Incandescent Gas-Light Company.

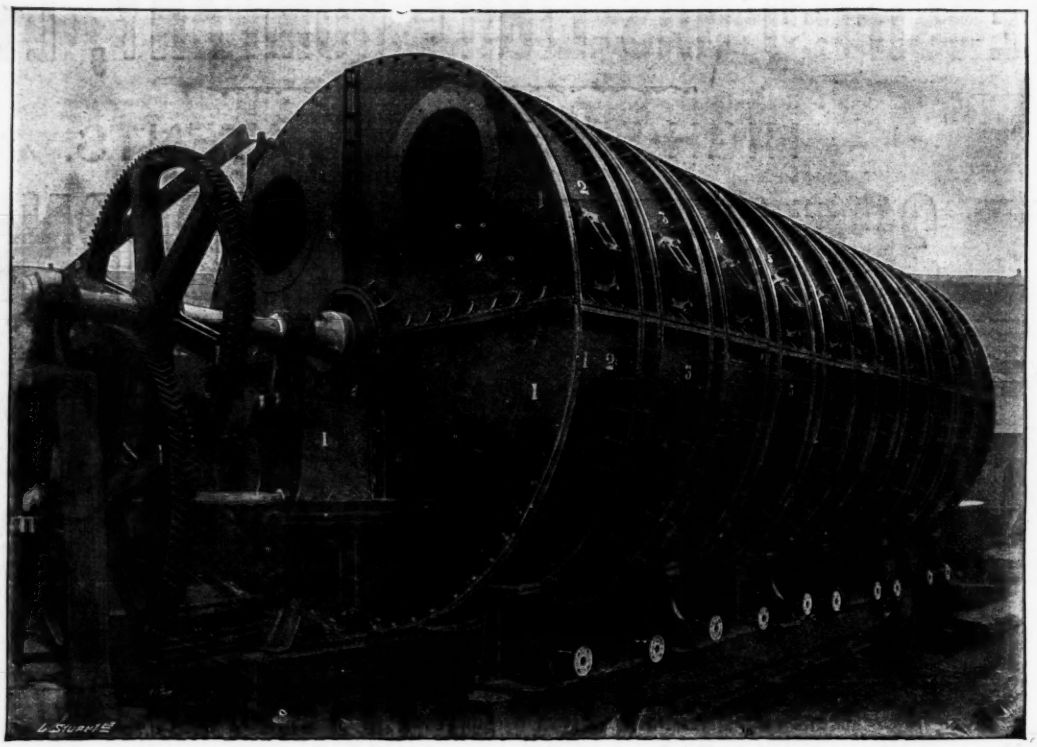
For full Particulars apply to the Company's Works—

3, WILSON ST., DRURY LANE,

LONDON, W.C.

PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

Photo. of Machine recently erected at Gaythorn Gas-Works, Manchester.

NOTE: Orders already received in **1900** for MACHINES to deal with **23,500,000** cubic feet of Gas per Diem.

ADDITIONAL ORDERS received WEEK ENDING MARCH 10 for MACHINES as under:—

SUNDERLAND GAS COMPANY, BISHOP AUCKLAND GAS COMPANY, TYNEMOUTH GAS COMPANY, SELKIRK GAS COMPANY, BEVERLEY CORPORATION GAS-WORKS, HOLMFIRTH GAS COMPANY, increasing the total to

27,800,000 CUBIC FEET OF GAS PER DIEM.

Patentees and Sole Makers:

W. C. HOLMES & CO., WORKS: HUDDERSFIELD.

TELEGRAMS: "IGNITOR, LONDON." "HOLMES, HUDDERSFIELD."

D. HULETT & CO., LIMITED.

Show-rooms and Offices: 55 & 56, HIGH HOLBORN, LONDON.

Lamp & Meter Works: HARPUR MEWS, THEOBALD'S ROAD, LONDON.

MANUFACTURERS OF

OUTSIDE GAS-LAMPS

Suitable for Incandescent or Ordinary Burners.

DRY GAS-METERS, SERVICE-CLEANSERS, &c., &c.

PRICE LISTS ON APPLICATION.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

Manufacturers of Glasshouse Pots and Crucibles of every kind.
Established 1836.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N.
GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

MAKERS OF
CLAYTON, SON & Co LTD LEEDS
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
OTHER SPECIALTIES
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.
Telegraphic Addresses: "GAS, LEEDS." "ECLARAGE LONDON."

INTERESTING EXTRACT FROM AN ENGINEER'S LETTER.

RECEIVED JAN. 25, 1900.

"During the Summer this town was visited by a severe typhoon **LASTING THREE DAYS.** The peculiarity of our typhoon is the wind seems to come in **TREMENDOUS GUSTS** from varying directions. This, of course, tests the stability of any structure; and you will therefore be glad to hear that your **SPIRAL-GUIDED GASHOLDER** stood the trial admirably. Our Gasholders with Columns and Girders were oscillating over 4 inches; but although the spiral was inflated well up in the second lift, there was **NO VISIBLE MOVEMENT.** This is extremely gratifying to me after advising my Directors to adopt your type. Please let me know **IF YOU CAN INCREASE THE STORAGE OF MY OTHER GASHOLDERS ON THIS SYSTEM** by adding additional Lifts."

Any further Information required should be obtained from

R. & J. DEMPSTER, LTD.

(Who are Sole Proprietors of the Spiral Gasholder Patents),

GAS PLANT WORKS, OLDHAM ROAD,

MANCHESTER.

Telegraphic Address:
"Scrubber, Manchester."
Telephone Nos. 54 & 2296.

London Office:
165, Gresham House,
Old Broad Street, London, E.C.

Gas-Generator. Air-Blower.
IMPROVED LEAD-BURNING APPARATUS.

HUTCHINSON BROS. & CO., LTD.

GAS ENGINEERS, &c.

SPECIALITY.

LEAD WORK FOR SULPHATE OF AMMONIA PLANTS.

BEST QUALITY OF MATERIAL AND WORKMANSHIP.

SATURATORS, all Lead, or Strong Sheet Lead, in Wood Casing,

ACID TANKS, ELEVATORS, AND COCKS. LIQUOR AND LIME PUMPS OR INJECTORS.

Liquor-Cocks, Gauge Fittings, and Safety-Valves in Cast Iron.

HYDROMETERS, TEST-JARS (GLASS OR LEAD), COPPER SCOOPS, &c., &c.

IMPROVED LEAD-BURNING APPARATUS.

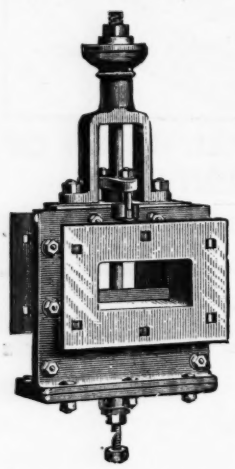
LEAD BURNERS SENT OUT TO REPAIRS.

FALCON WORKS BARNSLEY.

Telegrams: "HUTCHINSON BROS., BARNSLEY."

Telegraphic Address:
"CLAPHAM BROS., KEIGHLEY."

National Telephone
No: "KEIGHLEY 35."



"TRADE FOLLOWS THE FLAG"

CLAPHAM BROTHERS LTD

KEIGHLEY, YORKS. ESTABLISHED 1857

"SPECIALTIES"

London Representative:
THOMAS B. YOUNGER, C.E.
CHESTERFIELD HOUSE, 98, GREAT TOWER STREET.

Contractors to Her Majesty's Government.

WELLINGTON, NELSON, AND MARKET STREET WORKS.

LONDON OFFICE:
34, VICTORIA ST., WESTMINSTER, S.W.

TELEGRAPHIC ADDRESS:
"DRAKESON, HALIFAX."

TELEPHONE No. 43
"HALIFAX EXCHANGE."

GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
—FOR—
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.
OVENDEN HALIFAX

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, March 13, 1900.